SRM
UNIVERSITY
(Under section 3 of UGC Act 1956)

Model Questions - M.Tech

Civil (Section code 01)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$

c) Eigenvectors of A are independent d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl $\neq$ 5 c) cl =4 d) cl $\neq$ 4

4) Sf $Z = \frac{x^3 + y^3}{x + y}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\frac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\frac{dy}{dx} = \frac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$

c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}$ $(N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \sqrt[\frac{1}{2}]{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) Mezzanine floor is

a) Floor where explosive materials are stored
b) An intermediate floor between two floors
c) Floor space available for future expansion
d) Basement floor.

12) Furniture in a room is treated as

a) Dead load
b) Imposed load
c) Moving load
d) Dynamic load

13) In case of pitched roofs up to a slope of 30^0 the wind load acts

a) Away from roof
b) Towards the roof
c) Away from roof on windward side and towards the roof in leeward side
d) Towards the roof on windward side and away from the roof in leeward side

14) Grillage foundation is

a) RCC foundation
b) Foundation below closely spaced columns
c) Steel foundation
d) A type of pile foundation

15) The most suitable type of foundation for a 2 storey building on expansive soils is

a) Under-reamed pile foundation
b) Pre-cast driven piles
c) Raft foundation
d) *Cast-in-situ* pile foundation

16) The dimensions of modular clay bricks are

a) 220X95X65 mm
b) 200X100X100 mm
c) 230X115X75 mm
d) 190X90X90 mm

17) The most commonly adopted bond in brickwork in India is

a) Flemish bond
b) Stretcher bond
c) Header bond
d) English bond

18) Bond stones are

a) Provided in brickwork

b) Provided at the junction between column and brickwork
c) Stones which extend through the thickness of wall in stone masonry
d) Interface between stone and brick masonries

19) The best type of masonry among the following is
a) Random rubble masonry
b) Coursed rubble masonry
c) Squared rubble masonry
d) Ashler masonry

20) Cavity walls are provided
a) To prevent dampness
b) To increase strength
c) To act as partitions
d) To make structures earthquake resistance

21) The fundamental principle of surveying is to
a) Work from part to whole
b) Work from whole to part
c) Work from low level to high level
d) Work from high level to low level

22) The reduced bearing of $242^{0}45'$ is
a) S$62^{0}45'$W
b) W$62^{0}45'$S
c) N$62^{0}45'$E
d) E$62^{0}45'$N

23) The GTS benchmarks are established by
a) Archeological Survey of India
b) Ministry of Urban Development
c) Ministry of Surface Transport
d) Department of Survey of India

24) The observed staff reading on a staff held at a point is 3.65m. The staff was found to be 0.2m off the vertical. The corrected reading on the staff was
a) 3.655
b) 3.645
c) 3.564
d) 3.466

25) The contour interval is
a) The horizontal distance between two consecutive contour lines
b) The vertical distance between two consecutive contour lines
c) Half the horizontal distance between two consecutive contour lines
d) Half the vertical distance between two consecutive contour lines

26) Of the following grades one does not belong to standard grade of concrete as per IS 456:2000. Identify it.
a) M35
b) M30
c) M25
d) M20

27) Maximum water cement ratio permitted for structural concrete is
a) 0.40
b) 0.45
c) 0.55
d) 0.60

28) In a simply supported RCC 'T' beam of span 6m, web width 250 mm, beam centre to centre spacing 4m supporting a slab of 120 mm monolithically cast the effective width is
a) 1970 mm
b) 2270 mm
c) 3000 mm
d) 2000 mm

29) The development length in tension L_d for a 20 mm diameter bar with longitudinal stress of 230 N/mm^2 and bond stress is 1.2 N/mm^2 is
a) 958 mm
b) 858 mm
c) 500 mm
d) 300 mm

30) In RCC columns the maximum spacing of longitudinal bars measured along the periphery of the columns is
a) 250 mm
b) 200 mm
c) 350 mm
d) 300 mm

31) The spacing of vertical stirrups in a RCC beam is given by
a) $0.87f_yA_{sv}d/V_{us}$
b) $0.87f_yA_{sv}V_{us}/d$
c) $0.87fyV_{us}d/A_{sv}$
d) $f_yA_{sv}d/V_{us}$

32) A RCC beam cross section is subjected to a design moment of 150 kNm. $M_{u,lim}$ is 100 kNm. For the given dimensions the beam shall be designed as
a) Under reinforced beam
b) Over reinforced beam
c) Doubly reinforced beam
d) Deep beam

33) The drop in a flat slab is
a) Depression in slab top to accommodate the closets
b) Depression in top of slab to accommodate traps
c) Thickened portion around the column
d) Level difference in the slab between the adjoining rooms

34) Yield line theory is a method of analysis of
a) Under reinforced slabs
b) Over reinforced slabs
c) Slab portion forming part of 'T' beams
d) Steel beams

35) The moving loads in RCC bridges are taken from
- a) IS:456
- b) IS:1893
- c) Euro codes
- d) IRC codes

36) Water content in soil is given by
- a) Weight of water /Weight of solid
- b) Volume of water /Volume of soil
- c) Volume of water /Volume of voids
- d) Weight of water /Volume of solids in the soil

37) Void ratio of a clay sample is given by 0.40. The degree of saturation is 80% and the specific gravity of solids is 2.7. The water content is
- a) 10.85%
- b) 11.85%
- c) 12.85%
- d) 13.85%

38) In the experiment for determining the liquid limit of soils the liquid limit is the water content corresponding to
- a) 10 blows
- b) 15 blows
- c) 20 blows
- d) 25 blows

39) The soil pressure under a concentrated load of 1000kN at ground surface at a depth 4m below and 3m away from the load as determined by Boussineq's equation is
- a) 9.8 kN/m^2
- b) 9.8 N/m^2
- c) 98 kN/m^2
- d) 980 kN/m^2

40) While retaining earth if the wall moves away from the soil the pressure developed is termed as
- a) Passive earth pressure
- b) Active earth pressure
- c) Earth pressure at rest
- d) Intergranular pressure

41) A newtonian fluid suffers an angular deformation of 1.05 rad/s when under a shearing stress of 0.5 X 10^{-3} kN/m^2. The viscosity of fluid is
- a) 2.87 N-s/m^2
- b) 287 N-s/m^2
- c) 0.287 N-s/m^2
- d) 28.7 N-s/m^2

42) The pressure intensity at a depth of 1 km in an ocean where unit weight of water is 10.055 kN/m^3
- a) 10.55 MPa
- b) 1055 MPa
- c) 1.055 MPa

d) 5 MPa

43) A circular lamina of radius ‘r’ is vertical and just submerged in a liquid. The depth of centre of pressure from the free surface of liquid.

a) 10r/4
b) 9r/4
c) 8r/4
d) 5 r/4

44) Metacentre is

a) Is the intersection of horizontal axis of a floating body in equilibrium and the line of up thrust of the same body in its disturbed position
b) Is the intersection of normal axis of a floating body in equilibrium and the line of up thrust of the same body in its disturbed position
c) Is the intersection of normal axis of a floating body in equilibrium and the water surface
d) Is the intersection of normal axis of a floating body in equilibrium and the axis connecting the C.G of the body and the centre of pressure of the body.

45) Water flows through a pipe at 150 liters/s. The diameter of the pipe is 300 mm. The velocity head is

a) 0.228 m
b) 0.456 m
c) 0.114 m
d) 2.28 m

46) The loss of head in a sudden enlargement of pipe where the velocity changes from 2m/s to 1 m/s is

a) 1 m
b) 2 m
c) 0.5 m
d) 0.05m

47) In FLT system the dimensions of discharge is

a) $L^2 T^{-1}$
b) $L^3 T^{-1}$
c) $L^4 T^{-1}$
d) $L^3 T^{-2}$

48) Oil was pumped through the pipe over a pumping head of 44.31 m at a discharge of 15 lps. The power required to drive the pump if the specific weight of water is 9123 N/m^3 and the efficiency of pump 0.65 is

a) 6.06 kW
b) 9.33 kW
c) 10 kW
d) 3.03 kW

49) A community with sewerage system has a population of 200,000. The per capita consumption in lpcd is given by

a) 280
b) 360
c) 400
d) 160

50) In a tube well water table is met at 80 m below ground level. The suitable type of pump to pump water from the tube well is
a) Multi stage centrifugal pump
b) Centrifugal pump
c) Submersible pump
d) A combination of centrifugal and reciprocating pump system

51) The concentration of $(OH)^{-1}$ ions in a sample of water is 10^{-10}. The p^H of the water is
a) 14
b) 4
c) 10
d) 7

52) In a water treatment settling unit the average diameter of solid particles is 0.05 mm , specific gravity of solids 1.2 and kinematic viscosity of water 1.01 centistokes. According to Stoke's law the settling velocity is
a) 0.54 mm/s
b) 2.7 mm/s
c) 0.27 mm/s
d) 5.4 mm/s

53) In a rapid sand filter the bacteria removal efficiency is
a) 50%
b) 70%
c) 80%
d) 90%

54) Intze type of water tank body is
a) Fully spherical
b) Fully cylindrical
c) Portly conical and cylindrical
d) A combination of cylindrical, conical and spherical shapes.

55) The design flow in a main sewer is designed to receive flow from 1 square kilometer area with a population of 200 persons/hectare with average per capita sewage flow 150 l/day is
a) 30 mld
b) 3 mld
c) 300 mld
d) 6 mld

56) The volume of flow in a grit chamber when dry weather flow is 12 mld, design flow 3 times the DWF and detention period 1 minute is
a) 2.5 m^3
b) 0.225 m^3
c) 25 m^3
d) 250 m^3

57) WC represents
a) Water Change
b) Water Closet
c) Water Cess
d) Water Check

58) The deflection at the free end of the cantilever of span 'L' and flexural rigidity 'EI' due to unit load at the free end is given by
a) $WL^3/3EI$
b) $5WL^3/3EI$
c) $L^3/3EI$
d) $WL^3/2EI$

59) A square steel member of side 100 mm and length 300 mm is subjected to an axial load of 100 kN. The modulus of elasticity is 2×10^5 N/mm^2. The strain energy stored in the member is
a) 750 Nmm
b) 1500 Nmm
c) 375 Nmm
d) 100 Nmm

60) The conjugate beam of an overhanging beam with double overhangs is
a) Simply supported beam
b) Cantilever beam
c) Fixed beam
d) Fixed beam with two internal hinges at the supports.

61) The effective length of column of unsupported length 6 m with one end fixed and the other hinged is
a) 12m
b) 3 m
c) 6m
d) 4.24 m

62) A column has a moment of inertia of 5×10^6 mm^4 and its diameter is 100 mm. the radius of gyration is
a) 625 mm
b) 25.23 mm
c) 25.23 mm^3
d) 25.23 mm^2

63) The shear centre of a rectangular beam is at its
a) Bottom edge
b) Centre of gravity
c) Along the axes passing through the vertical edges
d) Along the axes passing through the horizontal edges

64) The fixed end moments of a fixed beam of span 8 m carrying a udl of 32 kN/m and a central concentrated load of 256 kN is
a) 352 kNm
b) 341.34 kNm
c) 342.38 kNm
d) 170.67 kNm

65) Two springs each of stiffness of 200 kN/m are connected in parallel. The equivalent spring stiffness is
a) 100 kN/m
b) 200 kN/m
c) 300 kN/m

d) 400 kN/m

66) In fig.1 and fig. 2 beams of identical properties are shown but with different loadings. The locations C and D are also identical. The deflection at C of the beam in fig. 2 is

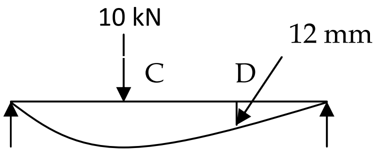


Fig. 1

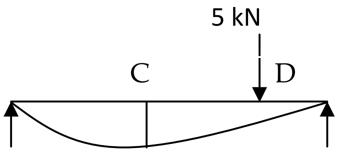


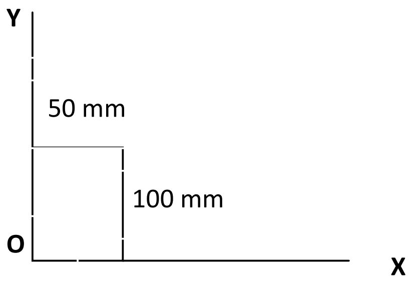
Fig. 2

a) 12 mm
b) 6 mm
c) 3 mm
d) insufficient data to find

67) A column is subjected to an eccentric load of 10 kN at an eccentricity of 30 mm. The equivalent design forces are
a) 10 kN axial load and 300 kNmm moment
b) 300 kNmm
c) 300 kNm
d) 200 kNm

68) The Young's modulus of the material is 2×10^5 N/mm^2 and Modulus of rigidity 1×10^5 N/mm^2. The bulk modulus is
a) 1.34×10^5 N/mm^2
b) 2.34×10^5 N/mm^2
c) 0.76×10^5 N/mm^2
d) 0.67×10^5 N/mm^2

69) The product moment of inertia of rectangular section shown about axes O-X and O-Y is



a) 416666 mm^4
b) 6.25×10^6 mm^4
c) 6.25×10^5 mm^4
d) 832000 mm^4

70) The section modulus of a hollow circular section of external diameter 100 mm and internal diameter 50 mm is
a) 184000 mm^3

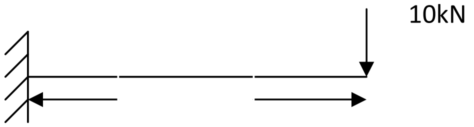
b) 184000 mm^4
c) 92000 mm^4
d) 92000 mm^3

71) A rectangular section of moment of inertia 2.5 X 10^{10} mm^4 is subjected to a moment of 100 kNm. If the modulus of elasticity is 2 X 10^4 N/mm^2 the radius of curvature is
a) 5 X 10^6 mm
b) 10 X 10^6 mm
c) 15 X 10^6 mm
d) 20 X 10^6 mm

72) A thin cylindrical shell of diameter 1000 mm is subjected to an internal pressure of 5 MPa. The thickness is 10 mm. The hoop stress is
a) 250 N/mm^2
b) 200 N/mm^2
c) 500 N/mm^2
d) 125 N/mm^2

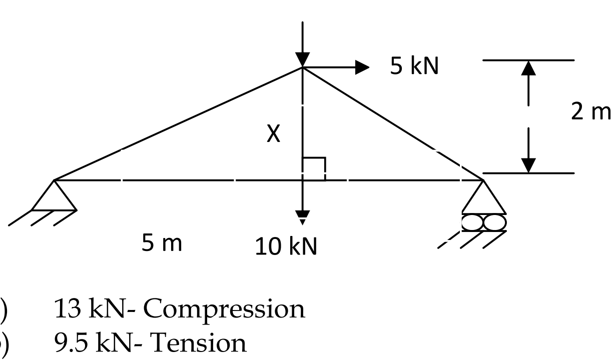
73) The product moment of inertia of a channel section of overall depth 300 mm, equal flange thickness 10 mm and web thickness 10 mm is
a) 123 x10^6 mm^4
b) 123 x10^6 mm^2
c) 123 x10^6 mm^3
d) 0

74) The reaction at the fixed support of cantilever shown in figure



a) Upward reaction of 10 kN and anticlockwise moment of 30 kNm
b) Upward reaction of 10 kN
c) Upward reaction of 10 kN and clockwise moment of 30 kNm
d) Anticlockwise moment of 30 kNm

75) The force in the member X of the truss shown is



a) 13 kN- Compression
b) 9.5 kN- Tension
c) 10 kN- Tension
d) 0

76) The state of stress in a material is pure shear of 100 N/mm^2. The principal stresses are

a) ±100 N/mm^2
b) ±50 N/mm^2
c) ±141 N/mm^2
d) ±150 N/mm^2

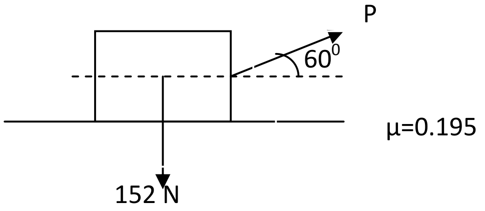
77) The moments of inertia of a rectangular section about its centroidal major and minor axes are 562.5 X 10^6 mm^4 and 390.625 X 10^6 mm^4. The polar moment of inertia is

a) 390.625 X 10^6 mm^4
b) 562.5 X 10^6 mm^4
c) 953.125 X 10^6 mm^4
d) 800 X 10^6 mm^4

78) A stressed element is subjected to principal stresses of 100 N/mm^2 (Tension) and 50 N/mm^2 (Compression). The maximum shear stress is

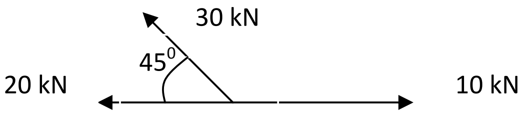
a) 50 N/mm^2
b) 75 N/mm^2
c) 100 N/mm^2
d) 37.5 N/mm^2

79) The pull 'P' required just to pull the body shown in figure is



a) 98.51 N
b) 304 N
c) 89.51 N
d) 76 N

80) The magnitude of resultant of the system of forces shown in figure is



a) 37.74 kN
b) 31.21 kN
c) 40 N
d) 30 N

81) The stopping sight distance in a single lane road having two way traffic with vehicle speed 50 kmph, coefficient of friction between road surface and tyres 0.4 and reaction time 3 s is

a) 67 m
b) 134 m
c) 100 m
d) 120 m

82) The allowable speed in a horizontal curve of radius 200 m, coefficient of lateral friction 0.15 and maximum super elevation 1 in 15 is
a) 37 kmph
b) 111 kmph
c) 47 kmph
d) 74 kmph

83) The theoretical traffic capacity of a one-way traffic lane at a stream speed of 40 kmph and space gap between vehicles 12.78 m is
a) 2987 vehicles/hour/lane
b) 3160 vehicles/hour/lane
c) 3130 vehicles/hour/lane
d) 1330 vehicles/hour/lane

84) Three types of traffic signs are
a) Precautionary signs, night signs and highway signs
b) Regulatory signs, warning signs and informatory signs
c) Accident signs, normal signs and curve signs
d) NH signs, express way signs and major district road signs

85) The recommended width of gap of expansion joint is
a) 100 mm
b) 25 mm
c) 100 mm
d) 2 m

86) The specific gravity of pure bitumen is
a) 1.5-2.0
b) 3.02-3.07
c) 9.8-10.5
d) 0.97-1.02

87) The delta of the crop if the duty for a base period of 110 days is 1400 hectares/cumec
a) 0.39 m
b) 0.68 m
c) 6.8 m
d) 1.36 m

88) Isohyet is line joining
a) Places of equal rainfall readings
b) Places of equal pressure readings
c) Places of equal temperature readings
d) Places of equal altitudes

89) The diameter of well required to get a discharge of 0.003 m^3 under a depression head of 2.5 m using K/A = 0.5m^3/hour/m^2 for unit depression head is
a) 6.8 m
b) 7 m
c) 3.4 m
d) 3.6 m

90) A dam stores water upto a height of 25 m. The horizontal force exerted by water for unit length of dam with unit weight of water 9.81 kN/m^3 is

a) 6130 kN
b) 1533 kN
c) 3065 kN
d) 250 kN

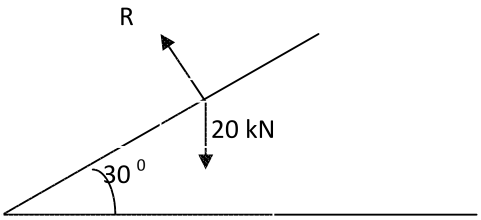
91) If the size of weld is 6 mm and the allowable stress 150 MPa , then the force per unit length of weld is

a) 900 N
b) 636 N
c) 720 N
d) 800 N

92) In a gantry girder the top flange channel over the flange of ISMB is provided to

a) To provide space for rails
b) To provide catwalk for workmen
c) To prevent lateral buckling of top flange
d) All of the above

93) The force 'R' normal to top chord member of the truss shown in figure is



a) 18.32 kN b) 10 kN c) 17.32 kN d) 15 kN

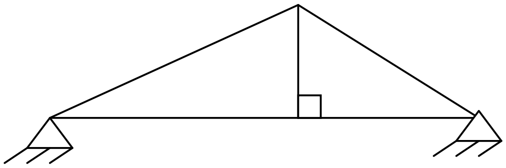
94) Uplift in foundation of columns supporting steel roof trusses is caused due to

a) Wind load
b) Dead load
c) Live load
d) None of the above

95) Sag bars in purlins are provided

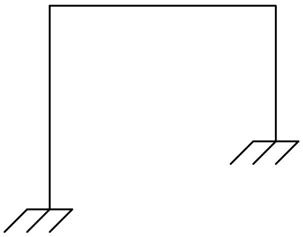
a) As additional support to roofing sheets
b) To facilitate hanging of lights
c) To reduce the span of purlins in the plane parallel to sheeting
d) To prevent blowing away of sheets due to wind

96) The degree of static indeterminacy of the truss shown in figure is



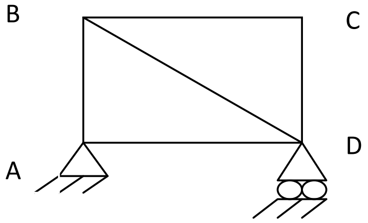
a) 0 b) 1 c) 2 d) 3

97) The degree of kinematic indeterminacy of the frame shown in figure is



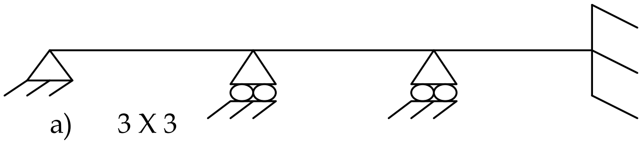
a) 1 b) 2 c) 3 d) 4

98) The Unit load to be applied for finding the relative movement between the joints B and D of the truss shown in figure is



a) At A towards D
b) At B towards D
c) At D towards B
d) At B and D towards each other

99) The order of stiffness matrix for the structure shown in figure is



a) 3 X 3
b) 2 X 2
c) 1 X 1
d) 4 X 4

100) In one of the fixed beams shown in figure beam mechanism exists. Which one isthat?

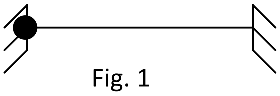


Fig. 1

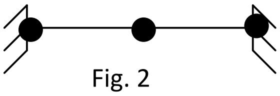


Fig. 2

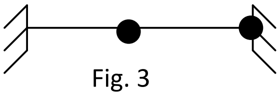


Fig. 3

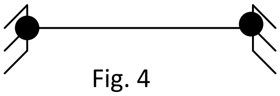


Fig. 4

Plastic hinge ●

a) Figure 4 b) Figure 2 c) Figure 1 d) Figure 3

Mechanical (Section code 02)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$

c) Eigenvectors of A are independent d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl ≠ 5 c) cl =4 d) cl ≠ 4

4) Sf $Z = \frac{x^2 + y^2}{x + y}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\frac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\frac{dy}{dx} = \frac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$

c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

C

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

D

A

9) Iteration formula to compute $\sqrt{N}$ $(N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \sqrt[\frac{1}{2}]{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) In case of double thread screw the lead is

a) equal to the pitch b) twice the pitch
c) half the pitch d) four times the pitch

12) The cross section of a V-belt is

a) rectangular b) square c) trapezoidal d) circular

13) The stiffness of a closely coiled helical spring is

a) equal to number of turns
b) directly proportional to number of turns
c) indirectly proportional to number of turns
d) independent of number of turns

14) Hoop or circumferential stress is equal to

a) longitudinal stress b) twice the longitudinal stress
c) half of the longitudinal stress d) four times the longitudinal stress

15) The property of material to withstand deformation without fracture is known as

a) plasticity b) toughness c) brittleness d) ductility

16) The hoop stress induced in a thick cylinder due to external pressure will be

a) compressive b) shear c) tensile d) torsion

17) The laminated spring is supported at the

a) centre b) both ends
c) one end only d) centre as well as both ends

18) The bending stress in a beam is

a) equal to bending moment
b) less than bending moment
c) directly proportional to the bending moment
d) inversely proportional to the bending moment

19) The most economical mild steel section is

a) I - section b) circular section
c) rectangular section d) channel section

20) The intensity of bending stress at any point in a beam is proportional to

a) distance from the neutral axis b) area of cross-section of the beam
c) length of the beam d) polar moment of inertia

21) Hooke's law states that within elastic limit

a) stress+strain = constant b) stress-strain = constant
c) stress x strain= constant d) $\frac{stress}{strain}$ = constant

22) The relation between modulus of rigidity (C) and young's modulus (E)is given by

a) C= $\frac{mE}{3(m-2)}$ b) C= $\frac{mE}{2(m-2)}$

c) C= $\frac{mE}{2(m+1)}$ d) C= $\frac{mE}{3(m+1)}$

23) The triangle law of forces is applicable for the resultant of

a) two forces b) three forces

c) four forces d) any number of forces

24) The moment of inertia of a triangle about its base is

a) $\frac{bh^3}{12}$ b) $\frac{bh^3}{24}$ c) $\frac{bh^3}{36}$ d) $\frac{bh^3}{48}$

25) The maximum displacement of a body moving with S.H.M is known as

a) time period b) frequency

c) oscillation d) amplitude

26) The time period of a simple pendulum depends upon

a) the mass of the bob b) the diameter of the bob

c) the acceleration due to gravity d) the amplitude of vibration

27) In a slider crank chain the number of possible inversions is

a) three b) four c) five d) six

28) The circular pitch is equal to

(D – Pitch Circle Diameter, T – No. of teeth)

a) $\frac{\pi D}{T}$ b) $\frac{\pi T}{D}$ c) πDT d) $\frac{2\pi D}{T}$

29) In case of flat cam follower the shape of working surface of cam must be

a) concave b) convex c) square d) any shape

30) Stress concentration in cyclic loading is more serious in

a) ductile materials b) brittle materials

c) equally serious in both cases d) depends on other factors

31) The notch angle of the Izod impact test specimen is

a) 10^0 b) 20^0 c) 30^0 d) 45^0

32) Ball bearing type screws are found in following applications

a) screw jack b) aeroplane engines

c) crane d) steering mechanisms

33) Choose the main technique used in project management
a) project evaluation and review technique
b) stage-coach technique
c) reliability improvement technique
d) dijkstra’s algorithm technique

34) The difference between the current duration and the crash duration of the selected activity is
a) line limit
b) crash limit
c) gross limit
d) free float

35) If the availability of information for a decision environment is partial, then the decision taken under such environment is
a) decision under risk
b) decision under certainty
c) decision under uncertainty
d) saddle point

36) In a game with two palyers, if the gain of one player is equal to the loss of another player, then that game is
a) two-person-zero-sum game
b) saddle point
c) maximum principle
d) minimax strategy

37) The fixture for joining work piece with help of locator and clamping device is
a) broaching fixture
b) welding fixture
c) lathe fixture
d) slotting fixture

38) The operation of punching out of a hole or holes of any shape in the sheet is
a) blanking
b) piercing
c) swaging
d) planishing

39) The operation of making an unfinished cut through a limited length is
a) slitting
b) shaving
c) trimming
d) notching

40) The feature of location that permits the parts to be made within their stated tolerance, part after a part throughout the production run is
a) referencing
b) positioning
c) repeatability
d) marking

41) For an air-conditioning plant of above 300 ton, the following system is preferred
a) centrifugal chiller
b) reciprocating compressor
c) hermetic compressor
d) absorption refrigeration

42) In variable speed SI engine, the maximum torque occurs at the maximum
a) shaft speed
b) brake power
c) volumetric efficiency
d) indicated power

43) Power to weight ratio of Diesel engine when compared to petrol engine is
a) higher
b) lower
c) same
d) not comparable

44) Reference fuels for knock rating of SI engine fuels include
a) iso-octane and α-methyl naphthalene b) iso-octane and n-hexane
c) iso-octane and n-heptane d) iso-octane and aniline

45) In milk chilling plants, the usual secondary refrigerant is
a) brine solution b) ammonia c) glycol d) silicate

46) Flameless combustion means
a) Inert gas combustion b) Invisible combustion
c) Catalytic combustion d) Combustion in vacuum

47) In an isothermal process the internal energy
a) increases b) decreases
c) remains constant d) increase and decrease

48) A heat engine is supplied with heat rate of 30 kJ/s and gives output of 9 kW. Thermal efficiency of engine will be
a) 30% b) 33% c) 40% d) 50%

49) Zeroth law of thermodynamics is related to the following property:
a) Enthalpy b) Entropy c) Temperature d) Work

50) Joule-Kelvin coefficient is denoted by
a) $(\partial T/\partial p)_h$ b) $(\partial T/\partial S)_h$ c) $(\partial S/\partial p)_h$ d) $(\partial S/\partial v)_h$

51) A device used to drain off the water from the steam pipes without escape of steam is
a) steam injector b) steam separator c) steam trap d) relief valve

52) The temperature required to produce pre-ignition in SI engine is in the order of
a) 790°C b) 890°C c) 910°C d) 1100°C

53) Automobile axle is subjected to
a) torsional moment b) impact load c) bending stress d) shear stress

54) The method of increasing the inlet air density to the engine is called as
a) turbocharging b) supercharging c) recharging d) scavenging

55) The property which remains constant during throttling is
a) entropy b) temperature c) internal energy d) enthalpy

56) The critical speed of shaft is affected by the
a) diameter and eccentricity b) span and eccentricity
c) span and diameter d) span of the shaft

57) The type of chain used in motor cycle is

a) bush roller b) silent chain c) pintle chain d) ewast chain

58) Gear box is used to

a) to produce torque

b) to increase efficiency

c) to damp out shocks

d) to obtain variable speeds

59) Davis gear consists of

a) sliding pair

b) turning pair

c) higher pair

d) rolling pair

60) Thermal efficiency of Diesel engine is in the order of

a) 55% b) 45% c) 35% d) 25%

61) One ton refrigeration is equivalent to

a) 1.5 kW b) 2.5 kW c) 3.5 kW d) 4.5 kW

62) A reversible heat pump having COP of 5.5 absorbs 2 kW of compressor work and maintains the room at a temperature of 25° C, the heat supplied to the room by the heat pump is

a) 10.1 kJ/s b) 11.0 kJ/s c) 11.3 kJ/s d) 10.8 kJ/s

63) The work done by an engine is 15 kJ per cycle and the piston displacement of the engine is 0.02 m^3. The mean effective pressure is

a) 6.5 bar b) 7.5 bar c) 8.5 bar d) 9.5 bar

64) A regenerative steam cycle renders

a) increased work output per kg of steam

b) decreased work output per kg of steam

c) increased thermal efficiency

d) decreased thermal efficiency

65) Which is having highest thermal conductivity?

a) ice b) water c) steam d) saturated steam

66) Which one of the following is not a necessary information input to Material Requirements Planning?

a) Inventory on hand

b) Bill of materials

c) Sequence of operations on a job

d) Master production schedule (MPS)

67) Which of the following cannot be cut by hobbing process?

a) Helical gears

b) Bevel gears

c) Worm gears

d) Spur gears

68) Which of the following is a single point cutting tool ?

a) Hacksaw blade

b) Milling cutter

c) Grinding wheel

d) Parting tool

69) The purpose of chaplets is
- a) Just chills to ensure directional solidification
- b) To provide venting
- c) To support the cores
- d) Compress moulding sand

70) Sprue in casting refers to
- a) Runner
- b) Riser
- c) Horizontal passage
- d) Vertical passage

71) Core prints are used to
- a) Strengthen core
- b) Form a seat to support and hold the core in place
- c) Fabricate core
- d) Make impressions

72) In combination dies
- a) Two or more cutting operations can be performed simultaneously
- b) Cutting and formation operations are combined and carried out in single operation
- c) Work piece moves from one station to another with separate operation done in each station
- d) Two or more cutting operations can be performed one after other

73) Which of the following is a single point cutting tool ?
- a) Hacksaw blade
- b) Milling cutter
- c) Grinding wheel
- d) Parting tool

74) During ultrasonic machining, the metal removal is achieved by
- a) high frequency eddy currents
- b) high frequency sound waves
- c) hammering action of abrasive particles
- d) rubbing action between tool and work piece

75) Assertion (A) : Forging dies are provided with taper or draft angles on vertical surfaces.
Reason (R) : It facilitates complete filling of die cavity and favorable grain flow.
- a) Both A and R are individually true and R is the correct explanation of A.
- b) Both A and R are individually true but R is not the correct explanation of A.
- c) A is true but R is false
- d) A is false but R is true

76) Assertion (A) : In anti-friction bearings, the frictional resistance is very low as the shaft held by it remains in floating condition by the hydrodynamic pressure developed by the lubricant
Reason (R) : In hydrodynamic journal bearings, hydrodynamic pressure is developed because of flow of lubricant in a converging-diverging channel.
- a) Both A and R are individually true and R is the correct explanation of A.
- b) Both A and R are individually true but R is not the correct explanation of A.
- c) A is true but R is false
- d) A is false but R is true

77) Assertion(A): Crowning is provided on the surface of a flat pulley to prevent slipping of the belt sideways.
Reason (R) : Belt creep, which is the reason for slip of the belt sideways, is fully compensated by providing crowning on the pulley.

a) Both A and R are individually true and R is the correct explanation of A.
b) Both A and R are individually true but R is not the correct explanation of A.
c) A is true but R is false
d) A is false but R is true

78) In which one of the following is a flywheel generally employed ?

a) Lathe
b) Electric motor
c) Punching machine
d) Gearbox

79) Match List-I (Effect of Cooling) with List-II (Cooling Medium) and select the correct answer using the code given below :

List-I	List-II
A. Martensite	1. Water quenched
B. Very fine pearlite	2. Air cooled
C. Fine pearlite	3. Furnace cooled
D. Coarse pearlite	4. Oil quenched

	A	B	C	D
a)	1	4	2	3
b)	2	3	1	4
c)	2	3	4	1
d)	1	2	3	4

80) Tempering is a process of annealing

a) martensite at low temperatures
b) martensite at higher temperatures
c) bainite at low temperatures
d) bainite at higher temperatures

81) For machining a casting on a lathe ,it should be held in

a) collet chuck
b) magnetic chuck
c) three jaw chuck
d) four jaw chuck

82) Continuous chips will be formed when machining speed is

a) High
b) Low
c) Irrespective of cutting speed
c) Medium

83) The types of chip produced when cutting ductile material is

a) Continuous
b) Discontinuous
c) With Built Up Edge
d) None of the above

84) In case of power screws, what is the combination of materials used for the screw and the nut ?

a) Cast iron screw and mild steel nut
b) Carbon steel screw and phosphor bronze nut
c) Cast iron screw and cast iron nut
d) Aluminium screw and alloy steel nut

85) Which of the following is/are used for cutting internal gears?
1. Gear hobber 2. Gear shaper 3. Rack cutter 4. Jig borer
Select the correct answer using the codes given below :
a) Only 1 and 2
b) Only 2 and 3
c) Only 1 and 4
d) Only 2

86) Machinability depends on
a) Microstructure, physical and mechanical properties and composition of work material
b) Cutting forces
c) Types of chips
d) Tool life

87) Which one of the following is a continuous bending process in which opposing rolls are used to produce long sections of formed shapes from coil or strip stock?
a) Stretch forming
b) Roll forming
c) Roll bending
d) Spinning

88) Arc stability is better with
a) AC welding
b) DC Welding
c) Both AC and DC Welding
d) Rectified supply

89) Thermoplastic materials cannot be produced by
a) Injection moulding process
b) Extrusion process
c) Blow moulding process
d) Both (a) and (b) above

90) Seam welding is
a) Multi spot welding process
b) Continuous spot welding process
c) Used for welding cylindrical objects
d) None of the above

91) In which of the following are metal moulds used ?
a) Greensand mould
b) Dry sand mould
c) Die casting process
d) Loam moulding

92) Weld spatter refers to
a) Welding electrode
b) Flux
c) Weld Defect
d)Filler material

93) What does hydrostatic pressure in extrusion process improve ?
a) Ductility
b) Compressive strength
c) Brittleness
d) Tensile strength

94) In a queuing problem, if the arrivals are completely random, then the probability distribution of number of arrivals in a given time follows
a) Poisson distribution
b) normal distribution
c) binomial distribution
d) exponential distribution

95) Which one of the following is not a technique under Predetermined Motion Time System (PMTS)?

a) Work factor b) Synthetic data
c) Stopwatch time study d) MTM

96) Which of the following materials is used in the manufacture of extrusion nozzles?

a) Grey cast iron b) Malleable cast iron
c) White cast iron d) Nodular cast iron

97) Match List I (Alloy) with List II (Major Constituent) and select the correct answer using the code given below the Lists

list I	List II
A. Babbitt	1. Nickel
B. Invar	2. Tin and lead
C. Gun Metal	3. Aluminium
D. Duralumin	4. Copper

A B C D
a) 2 4 1 3
b) 3 1 4 2
c) 2 1 4 3
d) 3 4 1 2

98) Increase of ferrite phase in steel increases :

a) Strength b) Hardness c) Ductility d) Brittleness

99) Match List I (Alloying Element) with List II (Effect on Steel) and select the correct answer using the code given below the Lists

List I	List II
A. Vanadium	1. Increases endurance strength
B. Molybdenum	2. Improves creep properties
C. Silicon	3. Increases hardness
D. Chromium	4. Increases resistance to high temperature oxidation

A B C D
a) 2 1 3 4
b) 1 3 2 4
c) 2 1 4 3
d) 1 2 4 3

100) In shell moulding, how can the shell thickness be accurately maintained ?

a) By controlling the time during which the pattern is in contact with mould
b) By controlling the time during which the pattern is heated
c) By maintaining the temperature of the pattern in the range of 175°C-380°C
d) By the type of binder used

Electrical (Section code 03)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$

c) Eigenvectors of A are independent d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl ≠ 5 c) cl =4 d) cl ≠ 4

4) Sf $Z = \dfrac{x^3 + y^3}{x + y}$, then $x\dfrac{\partial z}{\partial x} + y\dfrac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\displaystyle\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\dfrac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\dfrac{dy}{dx} = \dfrac{x^4 - y}{x}$ is

a) $xy = x^5 + 5c$ b) $5xy = x^5 + c$

c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}$ $(N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \frac{1}{2}\sqrt{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) Pipelining concept is introduced in
a) Intel 8085 b) Intel 8086 c) Motorola 68000 d) NEC 850

12) The maximum memory expansion capability in Motorola MC68000 is
a) 16MB b) 1 MB c) 32MB d) 64MB

13) The technique used by the processor to allow bus access to any requesting device when the processor is not currently using the bus is called
a) DMA b) Bus arbitration c) Pipelining d) Bus segmentation

14) The keyboard can be interfaced using
a) 8279 b) 8251 c)8259 d) 8253

15) When a key is pressed on the keyboard, which standard is used for converting the keystroke into the corresponding bits ?
a) ANSI b) ASCII c) BCDIC d) SOP

16) Give the addressing mode for this instruction "Complement accumulator"
a) Register mode b) relative address mode
c) Direct address mode d) implied mode

17) Stack stores information in the manner that the item stored------------ retrieves
a) FIFO b) LIFO c) FILO d) LILO

18) When the microprocessor checks the status bit associated with the I/O devices for data transfer, then it is called
a) hardware controlled I/O b) program controlled I/O
c) I/O controlled I/O d) I/O controlled by hardware signals

19) Find the unique interrupt from the following:
a) INTR b) RST 5.5 c) RST 6.5 d)RST 7.5

20) Wein bridge oscillator is most often used whenever
a) wide range of high purity sine waves is to be generated
b) high feedback ratio is needed
c) square output waves are required
d) extremely high resonant frequencies are required.

21) CE amplifier is characterized by
a) low voltage gain b) single phase reversal
c) moderate power gain d) very high output impedance

22) The decibel is a measure of
a) power b) voltage c) current d) power level

23) Which of the following method used for biasing a BJT in integrated circuits is considered independent of transformer beta?
a) Fixed biasing b) voltage divider bias
c) Collector Feed Back bias d) base bias with collector Feed Back

24) If the input supply frequency is 50Hz, the output ripple frequency of a bridge rectifier is ------------Hz.

a) 100 b) 75 c) 50 d) 25

25) Which stage of a dc power supply uses a zener as the main component?

a) Rectifier b) voltage divider c) regulator d) filter

26) The PIV of a half-wave rectifier circuit, with a shunt capacitor filter is

a) $2V_{SM}$ b) V_{SM} c) $V_{SM}/2$ d) $3V_{SM}$

27) The width of depletion layer of a PN junction

a) decreases with light doping b) increases with heavy doping
c) is independent of applied voltage d) is increased under reverse bias

28) Reverse current in a silicon junction nearly doubles for every -------------^{o}C rise in temperature.

a) 10 b) 2 c) 6 d) 5

29) Operating time of a relay is the

a) time between the actuating quantity exceeds pickup value and the closing of relay contacts.
b) time between the initiation of fault and the circuit breaker operation
c) time between the relay operation and circuit breaker operation
d) Time between the initiation of fault and post fault condition.

30) In the inverse time current relays,

a) The operating time reduces as the actuating quantity increases in magnitude
b) The operating time increases as the actuating quantity increases in magnitude
c) The life time reduces as the operating current value increases in magnitude
d) The life time increases as the operating current value decreases in magnitude.

31) Basically, lightning arrestor is a

a) surge divertor b) surge alternator
c) surge reflector d) surge absorber

32) Stability of a power system refers to

a) It's ability to remain stable even after the disturbance
b) It's ability to prevent faults
c) It's ability to remain stable when no disturbance occurs
d) It's ability to prevent the operation of CB.

33) To increase power transfer capability, capacitor should be added

a) in series b) in parallel
c) in star d) in delta.

34) Which of the following voltage is not very common voltage.

a) 11KV b) 22KV c) 6.6KV d) 177KV

35) Q= $-I^2 X_c$ where '-' sign indicates

a) supply of reactive power
b) insufficiency of reactive power
c) reactive power absorbed
d) excess of reactive power

36) Infinite bus means

a) a very long transmission line
b) a large system with voltage and frequency remain constant
c) a large system with infinite load
d) a large system with finite load and very long transmission line.

37) The phase difference between the zero sequence components is

a) 60^{o}
b) 120^{o}
c) 90^{o}
d) 0^{o}

38) The characteristic equation of the T-Flip Flop is given by:

a) $Q^{+} = \overline{T}Q + T\overline{Q}$
b) $Q^{+} = T\overline{Q} + Q\overline{T}$
c) $Q^{+} = TQ$
d) $Q^{+} = T\overline{Q}$

39) Output of a Moore sequential machine is a function of

a) all present states of the machine
b) all the input states.
c) a few combinations of inputs & present state
d) all combinations inputs & present state

40) The logic which has highest speed is

a) DTL
b) RTL
c) ECL
d) TTL

41) The flip-flop free from race – around problem is

a) SR flip-flop
b) D-flip flop
c) T – flip flop
d) master slave JK flip flop

42) A n-state ripple counter will count up to

a) 2^n
b) 2^{n-1}
c) n
d) $2^n -1$

43) Logic 1 in positive logic system is represented by

a) zero level
b) lower voltage level
c) high voltage level
d) negative voltage

44) The gray code equivalent of binary number $(1000001)_2$ is

a) 1100001
b) 1100011
c) 1000011
d) 110101

45) Binary subtraction of (1111) –(111) will yield

a) 1100
b) 1000
c) 1001
d) 1010

46) If the chopper switching frequency is 200Hz and T_{ON} time is 2ms, the duty cycle is

a) 0.4
b) 0.8
c) 0.6
d) 1.0

47) Chopper control for DC motor provides variation in ------------------

a) Input voltage b) frequency c) both (a) & (b) d) current.

48) A step-up chopper has Vs as the source voltage and α as the duty cycle. The output voltage for this chopper is given by.

a) Vs $(1+\alpha)$ b) Vs / $(1-\alpha)$ c) Vs $(1-\alpha)$ d) Vs / $(1+\alpha)$

49) For an under damped R-L-C load, Forced commutation is not required if frequency of output is

a) greater than ringing frequency
b) less than ringing frequency
c) equal to the ringing frequency
d) unity.

50) Parallel inverter employs---------------

a) Natural commutation
b) Forced commutation
c) Auxiliary current commutation
d) Complementary voltage commutation

51) As compared to power MOSFET, BJT has

a) lower switching losses but higher conduction loss
b) higher switching losses and higher conduction loss
c) higher switching losses but lower conduction loss
d) lower switching losses and lower conduction loss

52) The three terminals of MCT are

a) Anode, cathode and gate
b) collector, emitter and gate
c) Drain, source and base
d) drain, source and gate

53) When a thyristor gets turned on, the gate drive

a) should not be removed as it will turn-off the SCR
b) may or may not be removed
c) should be removed
d) should be removed in order to avoid increased losses and higher junction temperature

54) The function of snubber circuit connected across an SCR is to

a) suppress dv/dt
b) increae dv /dt
c) decrease dv/dt
d) keep transient over voltage at a constant value

55) The no load current in a transformer with respect to the primary voltage

a) leads by 90^{o}
b) lags by 90^{o}
c) leads by slightly less than 90^{o}
d) lags by slightly less than 90^{o}

56) Variable losses in a rotating machines are

a) copper loss and stray load loss
b) copper loss only
c) core loss only
d) core loss and mechanical loss

57) According to Fleming's left hand rule, when the fore finger points in the direction of the field or flux, the middle finger will point in the direction of
a) current in the conductor b) movement of the conductor
c) resultant force on the conductor d) induced voltage in the conductor.

58) If the field of a DC shunt motor gets opened while motor is running
a) the speed of motor will be reduced
b) the armature current will reduce
c) the motor will attain dangerously high speed
d) the motor will continue to run at constant speed

59) If a DC motor is connected across the AC supply, it will
a) run at normal speed
b) not run
c) run at lower speed
d) Burn due to heat produced in the field winding by eddy currents

60) A direct on line starter is used for starting motors rated upto
a) 5 H.P b) 10 H.P c) 15 H.P d) 20 H.P

61) What will happen if the back E.M.F of a DC motor vanishes suddenly?
a) The motor will stop b) The motor will continue to run
c) The armature will burn d) The motor will run noisy

62) The brush voltage drop in dc motor is in the order of
a) 2V b) 10V c) 20V d) 40V

63) A synchronous motor working at leading power factor can be used as
a) voltage booster b) phase advancer
c) noise generator d) mechanical synchronizer

64) Higher the applied voltage, ------ will be the stator flux and ----- will be the pull in torque
a) lower, lower b) lower, greater
c) greater, lower d) greater, greater

65) An unexcited single phase synchronous motor is
a) Reluctance motor b) universal motor
c) Repulsion motor d) AC series motor

66) In a synchronous motor, the ratio of starting torque to running torque is
a) infinite b) zero c) 1.0 d) 0.5

67) Which of the following can not be determined by circle diagram?
a) Efficiency b) power factor c) frequency d) output

68) If air gap of an induction motor is increased, its
a) power factor will increase b) magnetizing current will decrease
c) magnetizing current will increase d) power factor will decrease

69) Slip rings in induction motors are made of

a) Phosphor bronze
b) aluminum
c) Carbon
d) cobalt steel

70) In AC series motor, the purpose of providing compensating winding is to

a) Reduce sparking at brushes
b) increase the torque
c) Reduce heating of armature
d) minimize vibrations

71) In a dc machine, the interpole winding is connected

a) in series with the field winding
b) in parallel with the field winding
c) in series with the armature winding
d) in parallel with the armature winding

72) In a DC motor if the back EMF is absent

a) motor will burn
b) motor will not run at all
c) motor will run at very slow speed
d) motor will run at very high speed

73) Given that the transfer functions G(s) is $\frac{K}{s^2(1+sT)}$. State the type and order of the system.

a) 2 and 3
b) 3 and 2
c) 3 and 3
d) 2 and 2

74) An all-pass network imparts only

a) Negative phase to the input
b) positive phase to the input
c) ± 90° phase shift to the input
d) ± 180° phase shift to the input

75) If a system has multiple poles on the jω-axis, the system is

a) Stable
b) unstable
c) marginally stable
d) conditionally stable

76) A minimum-phase system with no zeros has a phase angle of -270° at gain crossover frequency. The system is

a) Stable
b) unstable
c) marginally stable
d) conditionally stable

77) 20dB / decade corresponds to

a) 3dB / octave
b) 6dB/octave
c) 9dB/octave
d) 20dB/octave

78) An integral controller is used to improve the transient response of first order system. If G(s) = $\frac{1}{1+s}$ and the system is operated in closed-loop with unity feedback, what is the value of T_i, if integral controller transfer function is $\frac{1}{T_i s}$ to provide damping ratio of 0.5?

a) 0.5
b) 2
c) 1
d) 4

79) If stability error for step input and speed of response be the criteria for design, what controller would you recommend?

a) P controller b) PD controller c) PI controller d) PID controller

80) The terms in the first column of Routh's array of a characteristic equation are 6, 9, 2, 4,-3. The number of roots of characteristic equation in the right half of S-plane is equal to

a) 0 b) 3 c) 4 d) 1

81) A unity feedback system has an open-loop transfer function G(s) = $\frac{K}{s(s^2+4s+13)}$.

The angles of asymptotes are given by

a) $45^o, 135^o, 225^o$ b) $60^o, 180^o, 300^o$

c) $90^o, 180^o, 270^o$ d) $30^o, 180^o, 300^o$

82) The total response of a system is denoted by y (t) = $\frac{1}{2}(2-e^{-3t})$. The steady state and transient response respectively are

a) 2, -3t b) 1, $-\frac{1}{2}e^{-3t}$ c) $\frac{1}{2}, e^{-3t}$ d) $-\frac{1}{2}e^{-3t}, 1$

83) The frequency at which the maximum voltage occurs across the inductance in an RLC circuit is

a) $\frac{1}{2\pi\sqrt{LC}}$ b) $\frac{1}{2\pi\sqrt{LC-\frac{(RC)^2}{2}}}$ c) $\frac{1}{2\pi}\sqrt{\frac{1}{LC}-\frac{R^2}{2L^2}}$ d) $\frac{1}{2\pi\sqrt{LC-R^2}}$

84) With initial current I_o, an inductor at $t=0^+$ acts as

a) Short circuit b) open circuit

c) Current source d) voltage source

85) The current magnification of the circuit at Resonance is

a) $\frac{C}{RL}$ b) $\frac{1}{R}\sqrt{\frac{C}{L}}$ c) $\frac{1}{R}\sqrt{\frac{L}{C}}$ d) $\frac{RC}{L}$

86) Two coils in differential connection have self-inductance of 2mH and 4mH and a mutual inductance of 0.15 mH. The equivalent inductance of the combination is

a) 5.7mH b) 5.85mH c) 6mH d) 6.15mH

87) A coil with a certain number of turns has a specified time constant. If the number of turns is doubled, its time constant would

a) remain unaffected b) become doubled

c) become one fourth d) get halved

88) Superposition theorem is NOT applicable to network containing

a) Power calculations b) dependent voltage sources

c) Independent sources d) transformers

89) The integral of a step function is
a) Ramp function b) impulse function
c) Modified ramp function d) sinusoid

90) The inductors are basically designed to have-------------Q factor.
a) Low b) high c) medium d) zero

91) The condition AD-BC=1 for two port network implies that the network is a
a) reciprocal b) lumped c) lossless d) unilateral

92) A high – pass filter circuit is basically
a) a differentiating circuit with low time constant
b) a differentiating circuit with large time constant
c) an integrating circuit with low time constant
d) an integrating circuit with high time-constant

93) A two-port network with short circuited admittance Y_{11} , Y_{12} , Y_{21} and Y_{22} is terminated through a resistance R at port 2. The overall Y_{21} of the network is

a) $\dfrac{Y_{21}}{Y_{22}+\dfrac{1}{R}}$ b) $Y_{21}+\dfrac{1}{R}$ c) $\dfrac{\dfrac{Y_{21}}{R}}{Y_{22}+\dfrac{1}{R}}$ d) $\dfrac{Y_{21}+\dfrac{1}{R}}{Y_{22}}$

94) For a transfer function H(s) = P(s) / Q(s) where P(s) and Q(s) are polynomials of s
a) The degree of P(s) and Q(s) are same.
b) The degree of P(s) is always greater than that of Q(s)
c) The degree of P(s) is independent of the degree of Q(s)
d) The maximum degree of P(s) and Q(s) differ by one.

95) A capacitor C is connected across a coil with resistance R and inductance L. The effective impedance of the circuit at resonance is
a) C/RL b) L/RC c) R/LC d) LC/R

96) Two coils are wound on a common magnetic core. The sign of mutual inductance M for finding out effective inductance of each coil is positive if
a) Two coils are wound in the same sense.
b) Fluxes produced by the two coils are equal
c) Fluxes produced by the coils act in the same direction
d) Fluxes produced by the two coils act in opposition.

97) A network N with impedance matrix $\begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix}$ is followed by an ideal transformer with 1: a ratio. The overall impedance matrix is

a) $\begin{bmatrix} az_{11} & z_{12} \\ z_{21} & a^2z_{22} \end{bmatrix}$ b) $\begin{bmatrix} z_{11} & az_{12} \\ az_{21} & z_{22} \end{bmatrix}$ c) $\begin{bmatrix} z_{11} & az_{12} \\ az_{21} & a^2z_{22} \end{bmatrix}$ d) $\begin{bmatrix} a^2z_{11} & az_{12} \\ az_{21} & a^2z_{22} \end{bmatrix}$

98) With the usual notation, a two-port resistive network satisfies the condition A=D = $\frac{3}{2}$; B = $\frac{4}{3}$ C. The Z_{11} of the network is

a) 5/3 b) 4/3 c) 2/3 d) 1/3

99) A Hurwitz polynomial has

a) zeros only in the left half of the s-plane
b) poles only in the left half of the s-plane
c) zeros anywhere in the s-plane
d) poles on the jω axis only

100) A 2-port network is terminated in a load Z_2 at its output port. The input impedance of the terminated two-port network is

a) $\frac{\Delta Z + Z_{22}Z_L}{Z_{11}Z_L}$ b) $\frac{Z_{22}}{\Delta Z}$ c) $\frac{\Delta Z + Z_{11}Z_L}{Z_{22} + Z_L}$ d) $\frac{Z_{11}}{\Delta Z}$

Electronics (Section code 04)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$

c) Eigenvectors of A are independent d) Eigenvectors of A are dependent.

3) System of equations $2n + 3y + 5z = 9$

$7n + 3y - 2z = 8$

$2n + 3y + \lambda z - \mu$ have unique solution if

a) cl =5 b) cl$\neq$ 5 c) cl =4 d) cl$\neq$ 4

4) Sf $Z = \dfrac{x^2 + y^2}{x + y}$, then $x\dfrac{\partial z}{\partial x} + y\dfrac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \; dn$ is equal to

a) $\dfrac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\dfrac{dy}{dx} = \dfrac{x^2 - y}{x}$ is

a) $xy - x^3 + 3c$ b) $3xy - x^3 + c$

c) $y = x^2 + c$ d) none of the above

7) If $f(z) - u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_n - iv$ b) $u_n + iv$ c) $u_n - iv_y$ d) $u_n + iv_x$

8) If $\nabla \phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zn)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}$ $(N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \frac{1}{2}\sqrt{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) A planar graph has 6 branches and 3 meshes. The total number of nodes is
(a) 6 (b) 4 (c) 3 (d) 2

12) A dc voltage V is applied to series RL circuit at time t = 0. The current at time t is equal to
(a) $(V/R)\ e^{-Rt/L}$ (b) $(V/R)\ (1-e^{-Rt/L})$ (c) $(V/R)e^{Rt/L}$ (d) $(V/R)(1-e^{Rt/L})$

13) Laplace transform of a unit impulse function is
(a) 1 (b) s (c) 1/s (d) $1/s^2$

14) Norton's theorem results in
(a) a current source with an impedance in parallel
(b) a voltage source with an impedance in series
(c) a voltage source alone
(d) a current source alone

15) The Superposition theorem is essentially based on the concept of
(a) duality (b) non-linearity (c) reciprocity (d) linearity

16) The relationship between voltage and current is same for two opposite directions of current in case of
(e) active network (b) passive network
(c) unilateral network (d) bilateral network

17) Kirchhoff's law when applied to an electronic network gave following equations:

$V_1 + V_2 - V_3 = 1$

$2V_1 + V_2 = 2$

$3V_1 + V_2 + 2V_3 = 0$

The values of V_1, V_2 and V_3 in volts will be respectively
(a) 4,6,3 (b) -4,6,3 (c) 4,-6,3 (d) 4,-6,-3

18) Inverse Laplace transform of $10/(s^2+4s+4)$ is
(a) $10te^{-2t}$ (b) $10t^2e^{-2t}$ (c) $10e^{-2t}$ (d) $5t^2e^{-2t}$

19) Maximum power transfer is given by
(a) V_{th}^2/R_{th} (b) $V_{th}^2/4R_{th}$ (c) $4V_{th}^2/R_{th}$ (d) $V_{th}^2/2R_{th}$

20) A terminal where three or more branches meet is known as
(a) combination (b) terminus (c) anode (d) node

21) Kirchhoff's law is applied to
(a) AC circuit only (b) DC circuit only
(c) AC as well as DC circuit (d) passive network only

22) Damping ratio is defined as the ratio of
(a) R to L (b) R to δ
(c) L to C (d) actual resistance R to the critical resistance R_c

23) The process by which impurities are added to a pure semiconductor is
(a) Diffusing (b) drift (c) doping (d) mixing

24) Any semiconductor material has a valence of __electrons
(a) 4 (b) 6 (c) 8 (d) 3 or 5

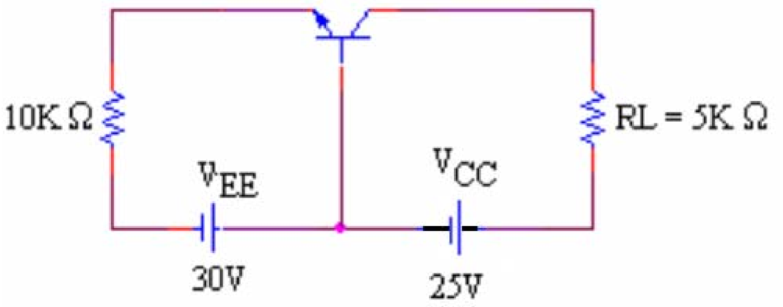
25) I_{CBO} current
(a) is smaller in silicon than in germanium transistors
(b) increases with temperature
(c) depends on base doping
(d) depends on eb junction bias

26) The parameters of JFET are related as
(a) $g_m = r_d/\mu$ (b) $g_m = \mu/r_d$ (c) $g_m = r_d$ (d) $g_m\mu = r_d/\mu$

27) As the temperature rises, the resistance of a pure metal ________ and that of a semi-conductor _________ .
(f) increases, decreases (b) decreases, increases
(c) increases, also increases (d) decreases, also decreases

28) Conventional biasing of a bipolar transistor has
(a) EB forward biased and CB forward biased
(b) EB reversed biased and CB forward biased
(c) EB forward biased and CB reversed biased
(d) EB reversed biased and CB reversed biased

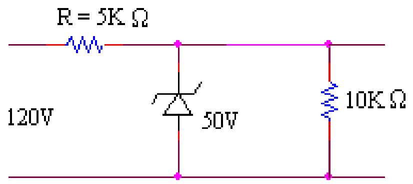
29) Find the Q point in circuit shown below



(a) 5V, 1mA (b) 5V, 3mA (c) 10V, 3mA (d) None

30) Pinch off voltage for a JFET is 4V when V_{GS} =1. The pinch off occurs for V_{DS} equal to
(a) 3V (b) 5V (c)4V (d)1V

31) Voltage drop across series resistance is



(a) 50V (b) 60V (c) 70V (d) 80V

32) For a transistor if α_{dc} = 0.98 and emitter current I_E is 2mA, the collector current will be

(a) 0.44mA (b) 0.88mA (c) 1.96mA (d) 3.3mA

33) Main advantage of IC technology is the possibility of

(g) securing high stability at low cost (b) using high values of capacitors

(c) fabricating low tolerance resistors (d) repairing individual circuit element

34) In monolithic IC, isolation may be easily obtained by

(a) using a layer of photo resist (b) scribing

(c) using reverse biased p-n junction (d) using SiO_2 layer

35) The photo-resist process is used

(a) during high temperature diffusion

(b) to prevent photo response

(c) to control the etching of SiO_2 from selected regions on a silicon slice

(d) to photograph the silicon slice

36) A signal is a periodic signal with period T if x(t)=

(a) x(-t) (b) x(t+T) (c) x(T) (d) x(1/t)

37) A signal is an energy signal if it has

(a) infinite energy (b) finite energy (c) zero energy (d) none of these

38) The fundamental period of a sinusoidal sequence is N=

(a) $2\pi m/\Omega_0$ (b) $2\pi m$ (c) $m\Omega_0$ (d) $\Omega_0/2\pi m$

39) The frequency spectrum of periodic signal is

(a) discrete (b) continuous (c) both (a) and (b) (d) none

40) The output y(t) of a linear network is equal to unit impulse response when the input is

(a) u(t) (b) r(t) (c) δ(t) (d) e^{at}

41) The convolution of two functions $f_1(t)$ and $f_2(t)$ in frequency domain is

(a) $f_1(t) * f_2(t)$ (b) $(1/2\pi)\, f_1(t) * f_2(t)$

(c) $F_1(\omega)\, F_2(\omega)$ (d) $(1/2\pi)\, F_1(\omega)\, F_2(\omega)$

42) A voice signal is to pass an LPF with cut-off frequency of 4 kHz. The sampling rate is _____ samples/s.

(a) 4000 (b) 2000 (c) 8000 (d) 100

43) The Laplace transform of e^{at} is

(a) 1/s-a (b) 1/s+a (c) 1/s (d) $1/(s+a)_2$

44) The final value theorem is used to find the

(a) Steady state value of the system output

(b) Initial value of the system output

(c) Transient behaviour of the system output (d) none

45) To solve a differential equation with initial conditions, the _______ transform is generally used.
(a) Fourier (b) Unilateral Laplace
(c) Bilateral Laplace (d) All the above

46) The ROC of X(z) consists of a ______ in the z-plane.
(a) ring (b) strip (c) rectangle (d) parabola

47) $Z[e^{j\omega n} x(n)] =$
(a) $X(e^{j\omega})$ (b) $X(e^{j\omega} z)$ (c) $X(e^{-j\omega} z)$ (d) $X(e^{-j\omega})$

48) The relation between carrier power and total power in an AM wave is
(a) $P_C = P_T (1+ m^2 /4)$ (b) $P_C = P_T (1+ m^2 /2)$
(c) $P_T = P_C (1+ m^2 /4)$ (d) $P_T = P_C (1+ m^2 /2)$

49) The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
(a) doubled (b) halved (c) unchanged (d) increased by 50%

50) An FM signal with a deviation δ is passed through a mixer and has its frequency reduced five fold. The deviation in the output of the mixer is
(a) 5δ (b) indeterminate (c) δ/5 (d) δ

51) The image frequency of a super heterodyne receiver
(a) is created within the receiver itself
(b) is due to insufficient adjacent channel rejection
(c) is not rejected by the IF tuned circuit
(d) is independent of the frequency to which the receiver is tuned

52) A signal of maximum frequency of 10kHz is sampled at Nyquist rate. The time interval between two successive samples is
(a) 50μsec (b) 100μsec (c) 1000μsec (d) 5μsec

53) Thermal noise power P_n equals
(a) kTB (b) $\bar{k}TB$ (c) kTB^2 (d) $\bar{k}TB^2$

54) In communication receivers the fidelity is provided by
(a) mixer stage(b) audio stage (c) detector stage (d) none of these

55) Quantizing noise is produced in
(a) FDM (b) PCM
(c) All modulation system (d) All pulse modulation system

56) Which of the following is the digital system?
(a) PWM (b) PAM (c) PPM (d) PCM

57) Which of the following is the main advantage of PCM system?
(a) Lower noise (b)Lower power
(c) Lower bandwidth (d) All of the above

58) Number of pulses in a code used in a PCM with 16 levels is
(a) 2 (b) 4 (c) 6 (d) 8

59) Minimum bandwidth necessary for a 60Mbit/sec data stream used in PSK modulation is
(a) 40MHz (b) 60MHz (c) 80MHz (d) 100MHz

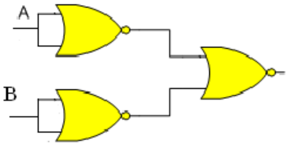
60) As compared to a closed-loop system an open-loop system is
(a) more stable as well as more accurate
(b) less stable as well as less accurate
(c) more stable but less accurate
(d) less stable but more accurate

61) Transfer function of a system is used to calculate
(a) the steady state gain (b) the main constant
(c) the order of the system (d) the output for any given input

62) The best method for determining the stability and transient response is
(a) Bode plot (b)Nyquist plot (c) Root locus (d)Nichols chart

63) In control system, damping is proportional to
a) gain b) 1/gain c)$\sqrt{\text{gain}}$ d) $1/\sqrt{\text{gain}}$

64) Consider the circuit shown below. Which logic function does this circuit generate?



(a) AND (b) NOR (c) NAND (d) XOR

65) The simplified form of the Boolean expression (X+Y+XY) (X+Z) is
(a) X+Y+Z (b) XY+YZ (c) X+YZ (d) XZ+Y

66) How many FFs are required to build a binary counter to count from 0 to 1023 ?
(a) 9 (b) 12 (c) 10 (d) 24

67) Which TTL sub-family has maximum speed?
(a) Standard TTL (b) Schottky TTL
(c) High Speed TTL (d) Low power TTL

68) The propagation delay for standard TTL device is approximately
(a) 1 ns (b) 10 ns (c) 25 ns (d) 15 ns

69) In 8085 microprocessor system, the direct addressing instruction is
(a) MOV A,B (b) MVI B, OA H (c) MOV C,M (d) STA adder

70) A microprocessor is capable of addressing 64K bytes of memory. Its address bus width is
(a) 8 (b) 12 (c) 16 (d) 20

71) Match List-I with List-II and select the correct answer using the codes given below

List-I (Logic gate)	List-II (Characteristic)
A. HTL	1. High fan out
B. CMOS	2. Highest speed of operation
C. I^2L	3. High noise immunity
D. ECL	4. Lowest product of power and delay

	A	B	C	D
(a)	4	3	2	1
(b)	4	1	2	3
(c)	3	1	4	2
(d)	3	4	1	2

72) Which of the following interrupts has the lowest priority?
(a) RST 5.5 (b) RST 7.5 (c) TRAP (d) INTR

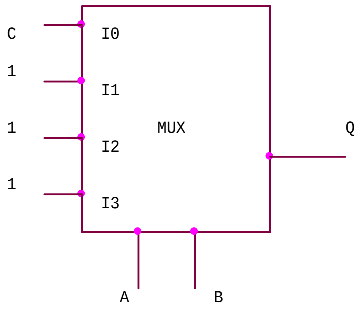
73) The binary equivalent of the octal number 13.54 is
(a) 1011.1011 (b) 1101.1110 (c) 1001.1110 (d) 1011.1101

74) STA 2400H is an example of _______________ mode
(a) register addressing (b) immediate addressing
(c) direct addressing (d) implicit addressing

75) A mask programmed ROM is
(a) programmed at the time of fabrication (b) programmed by the user
(c) erasable and programmable (d) erasable electrically

76) The register which keeps track of the sequence of instruction execution is
(a) memory address register (b) instruction register
(c) stack pointer (d) program counter

77) The combinational logic circuit shown in the figure has an output Q which is



(a) ABC (b) A+B+C
(c) A XOR B XOR C (d) A XNOR B XNOR C

78) Maxwell's divergence equation for the magnetic field is given by

a) $\nabla \times \overline{B}=0$ b) $\nabla \cdot \overline{B}=0$ c) $\nabla \times \overline{B}=\rho$ d) $\nabla \cdot \overline{B}=\rho$

79) A transmission line of characteristic impedance 50Ω is terminated in 50Ω. The input impedance is
(a) 25Ω (b) 50Ω (c) 100Ω (d) 200Ω

80) Distortion-less condition of a transmission line is given by

a) $Z_0=\sqrt{L/C}$ b) RC = LG c) RG = LC d) RL=GC

81) VSWR in a transmission line lies between
(a) 0 and ∞ (b) 1 and ∞ (c) 0 and 1 (d) 0 and Z_0

82) A 150Ω transmission line is connected to a load impedance yielding a VSWR of unity. The load impedance is
(a) 150Ω (b) 300Ω (c) 1Ω (d) 75Ω

83) The dominant mode in a rectangular waveguide is
(a) TE_{10} (b) TE_{01} (c) TM_{01} (d) TEM

84) One revolution on the Smith chart is equal to ______ wavelengths on a transmission line
(a)0.25 (b) 0.5 (c) 0.75 (d) 1

85) The two sets of circles, to represent real and imaginary parts of an impedance , on the Smith chart are
(a) constant X circles and constant Y circles
(b) constant R circles and constant X circles
(c) constant S circles and constant βs circles
(d) constant R circles and constant S circles

86) When there is no reflection in the transmission line, then reflection co-efficient (K)
(a) K = 0 (b) K = 1 (c) K = -1 (d) K = ∞

87) The efficiency of a full-wave rectifier is
(a) 40.6% (b) 81.2% (c) 50% (d) 95%

88) Which of the following is not an essential element of a dc power supply?
(a) Rectifier (b) Filter
(c) Voltage regulator (d) Voltage amplifier

89) Early effect in BJT refers to

(a) avalanche breakdown
(b) thermal breakdown
(c) base narrowing
(d) zener breakdown

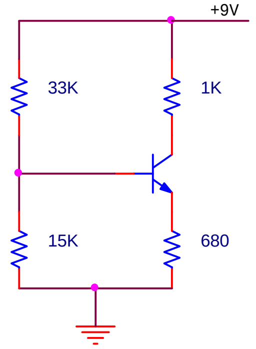
90) The input impedance of a JFET is in the range of

(a) above 2 MΩ
(b) 200 to 400 KΩ
(c) 20 to 40 KΩ
(d)below 2 KΩ

91) Improper biasing of a transistor circuit leads to

(a) excessive heat production at collector terminal
(b) distortion in output signal
(c) faulty location of load line
(d) heavy loading of emitter terminal

92) The emitter voltage V_E of the circuit shown in figure is approximately (Assume V_{BE} = 0.7V and $\beta = 100$)



(a) 2.81V
(b) 3.1V
(c) 2.11V
(d) 5.9V

93) The Darlington pair is mainly used for

(a) impedance matching
(b) wide band voltage amplification
(c) reducing distortion
(d) power amplification

94) Which oscillator uses a tapped coil in its tank circuit?

(a) Hartley oscillator
(b) Colpitts oscillator
(c) Wein-bridge oscillator
(d) RC Phase shift oscillator

95) Consider the following statements. Negative feedback in amplifiers results in

1. reduced voltage gain
2. reduced bandwidth
3. increased signal to noise ratio
4. reduced distortion

Of these statements

(a) 1 and 2 are correct
(b) 1, 3 and 4 are correct
(c) 2, 3 and 4 are correct
(d) 1 and 4 are correct

96) The output impedance of an ideal op-amp is

(a) zero
(b) infinity
(c) few K ohms
(d) few ohms

97) Common Mode Rejection Ratio for an op-amp should be

(a) close to zero (b) close to unity

(c) as small as possible (d) as large as possible

98) Consider the following devices

1. BJT in CB mode 2. BJT in CE mode 3. JFET 4.MOSFET

The correct sequence of these devices in increasing order of input resistance is

(a) 1,2,3,4 (b) 2,1,3,4 (c) 2,1,4,3 (d) 1,3,2,4

99) Match List-I with List-II and select the correct answer using the codes given below

List-I (Maximum efficiency in %)	List-II (Amplifiers)
A. 25	1. Class-B transformer coupled
B. 78.5	2. Class-A RC coupled
C. 100	3. Class-A transformer coupled
D. 50	4. Class-D switching mode

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	2	3	4	1
(c)	2	1	4	3
(d)	3	4	1	2

100) In a RC Phase-Shift oscillator, the expression for frequency of oscillation is

a) $f = 1/(2\pi\sqrt{RC})$ b) $f = 1/(2\pi RC\sqrt{6})$ c) $f = 1/(2\pi RC\sqrt{29})$ d) $f = 1/(\sqrt{2\pi RC})$

Instrumentation (Section code 05)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$

c) Eigenvectors of A are independent d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl ≠5 c) cl = 4 d) cl ≠4

4) Sf $Z = \frac{x^2 + y^2}{x + y}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\frac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\frac{dy}{dx} = \frac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$

c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}\ (N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \sqrt[\frac{1}{2}]{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) The Energy gap for Silicon at 300K is

(a) 0.12ev (b) 0.72ev (c) 1.21ev (d) 1.1ev

12) An Intrinsic Semiconductor at the absolute zero temperature

(a) behaves like an insulator
(b) has a large number of holes
(c) has few holes and same number of electrons
(d) behaves like a metallic conductor

13) The capacitance which exists in the forward biased PN junction is called

(a) Diffusion capacitance (b) Depletion layer capacitance
(c) Storage capacitance (d) Both (a) and (c)

14) The resistance of a diode is equal to

(a) Ohmic resistance of the P-type and N-type semiconductors
(b) Junction resistance
(c) Reverse resistance
(d) Algebraic sum of (a) and (b) above

15) The diode when reverse-biased acts like an almost constant Capacitance is

(a) Zener diode (b) Tunnel diode (c) Schottky diode (d) PIN diode

16) A step recovery diode

(a) has an extremely short recovery time
(b) is an ideal rectifier of high recovery signals
(c) is mainly used as a harmonic generator
(d) conducts equally well in both direction

17) A tunnel diode is

(a) a very heavily doped PN junction diode
(b) a high resistivity PN junction diode
(c) very lightly doped PN junction diode
(d) a slow switching device

18) LED's do not require

(a) heating (b) warm-up time (c) both (a) and (b) (d) none of the above

19) Before illuminating a P-N junction Photo diode, it has to be

(a) reverse-biased (b) forward-biased (c) switched ON (d) switched OFF

20) The LASCR operates like a

(a) Latch (b) LED (c) Photodiode (d) Phototransistor

21) The device possessing the highest sensitivity is a

(a) Photoconductive cell (b) Photovoltaic cell

(c) Photodiode (d) Phototransistor

22) In an integrated circuit, the SiO_2 layer provides

(a) electrical connection to the external circuit (b) physical strength

(c) isolation (d) conducting path

23) A process to transfer geometrical pattern from the mask to the surface of the Wafer:

(a) Epitaxy (b) Etching (c) Photoresist (d) Photolithography

24) In a Phase Locked Loop (PLL), the

(a) input frequency and the voltage-controlled oscillator(VCO) frequency are the same

(b) phase error is 180 degree

(c) VCO frequency is double the input frequency

(d) phase error is 90 degree

25) An ideal op-amp has

(a) zero input resistance (b) infinite output resistance

(c) zero output resistance (d) both input and output zero resistance

26) The slowest type of ADC is

(a) Flash type (b) Successive Approximation type

(c) Integrating type (d) Counting type

27) An analog voltage is in the range of 0 to 8V and is divided in eight equal intervals for conversion to 3-bit digital output. The maximum quantization error is

(a) 0 V (b) 0.5 V (c) 1 V (d) 2 V

28) When the collector junction in transistors is biased in the reverse direction and the emitter junction in the forward direction, the transistor is said to be in the

(a) Active region (b) Cut-off region

(c) Saturation region (d) None of the above

29) A transistor connected in Common-Base configuration has

(a) a high input resistance and a low output resistance

(b) a low input resistance and a high output resistance

(c) a low input resistance and a low output resistance

(d) a high input resistance and a high output resistance

30) The normal operating point region of JFET, when used as an amplifier is

(a) Ohmic region (b) Break down region

(c) Pinch off region (d) None of the above

31) Thermal run away is not possible in FET because as the temperature of the FET increases

(a) mobility decreases (b) mobility increases
(c) drain current increases (d) transconductance increases

32) A switching voltage regulator can be of the following type

(a) Step-down (b) Step-up (c) Inverting (d) All of the above

33) The Current gain in Darlington amplifier is

(a) low (b) high (c) zero (d) less than unity

34) The maximum overall efficiency of a Class-B Push-Pull amplifier cannot exceed

(a) 100 (b) 78.5 (c) 50 (d) 25

35) If Barkhausen Criterion is not fulfilled by an oscillator circuit, it will

(a) stop oscillating (b) produce damped waves continuously
(c) becomes an amplifier (d) produce sustained oscillations

36) The oscillator which provide an output having a square, rectangular or sawtooth waveform is called

(a) Relaxation oscillator (b) Harmonic oscillator
(c) Sinusoidal oscillator (d) None of the above

37) The Clamper circuits is used to

(a) restore a a.c level to d.c signal
(b) restore a d.c level to a.c signal
(c) to limit the voltage level of the input waveform
(d) to cut-off the portions of the input waveform

38) Positive Feedback is also known as

(a) Regenerative feedback (b) Degenerative feedback
(c) Direct feedback (d) Both (a) and (c)

39) The operation of Pirani gauge is based on

(a) ionization of gas at low pressure
(b) vibration of volume with pressure
(c) vibration of viscosity with pressure
(d) vibration of thermal conductivity of gas with pressure

40) Shaft encoder is used for the measurement of

(a) Angular velocity (b) Linear position
(c) Linear velocity (d) Linear acceleration

41) A metal Strain guage has guage factor of 2.Its nominal resistance is 120Ω.If it undergoes a strain of 10^{-5},the value of change of resistance in response to the strain is

(a) 240 Ω (b) 2×10^{-5} Ω (c) 2.4×10^{-3} Ω (d) 1.2×10^{-3} Ω

42) Which of the following can be measured by Hot Wire Anemometer?
(a) Gas velocities (b) Liquid discharges
(c) Pressure of gases (d) Very low pressure

43) Identify the correct set of matches from the following

A. Thermocouple	1. Modulated output
B. Thermistor	2. Good frequency response
C. Strain gauge	3. Negative temperature coefficient
D. LVDT	4. Constant temperature at one end

(a) A-3, B-2, C-4, D-1 (b) A-4, B-3, C-1, D-2
(c) A-2, B-1, C-4, D-3 (d) None of the above

44) Synchro is a
(a) Parabolic transducer (b) Angular position transducer
(c) Synchronizing transducer (d) Variable transducer

45) Which flowmeter can handle corrosive fluids, slurries and greasy materials?
(a) Electromagnetic flowmeter (b) Turbine flowmeter
(c) Pitot tube (d) Orifice meter

46) Which of the following instrument is used for the measurement of high temperature?
(a) Pyrometer (b) Thermistor
(c) Anemometer (d) Resistance Thermometer

47) Which is the flowmeter that has a Magnetic Pickup Coil?
(a) Electromagnetic flowmeter (b) Turbine flowmeter
(c) Venturimeter (d) Orificemeter

48) The velocity of the wind is determined by
(a) Speedometer (b) Anemometer (c) Dynamometer (d) Accelerometer

49) Which of the following Microprocessor uses the Pipelining concept?
(a) 8085 (b) 8086 (c) Both (a) and (b) (d) None of the above

50) In 8086, the Bus Interface Unit fetches how many instruction bytes ahead of time from the memory?
(a) 6 (b) 8 (c) 4 (d) 10

51) How many Kbytes of memory can be accessed by 8085?
(a) 32 (b) 64 (c) 128 (d) 256

52) In 8085, which type of Interrupt has the second highest priority?
(a) TRAP (b) RST 5.5 (c) RST 6.5 (d) RST 7.5

53) Microcontroller 8096 is a

(a) 8-bit (b) 16-bit (c) 32-bit (d) none of the above

54) Microcontroller 8051 can access up to 64Kbytes of

(a) external program memory (b) external data memory

(c) both (a) and (b) (d) none of the above

55) Interfacing IC 8259 is a

(a) Programmable interrupt controller (b) Programmable DMA controller

(c) Serial I/O interface (d) Programmable parallel interface

56) Which of the following IC is used as the Programmable Keyboard And Display Controller ?

(a) 8259 (b) 8279 (c) 8257 (d) 8251

57) The Thevenin's equivalent circuit consists of

(a) a constant voltage source with a resistance in series

(b) a constant voltage source with a resistance in parallel

(c) a constant current source with a resistance in series

(d) a constant current source with a resistance in parallel

58) In order to obtain Maximum Power from load terminals of a circuit, the resistance across the load terminals should be

(a) equal to Thevenin's resistance (b) less than Thevenin's resistance

(c) greater than Thevenin's resistance (d) equal to infinity

59) With the two Resistors in parallel, one of which is a 100Ω Resistor and other one is not known, the only likely value for the net resistance is

(a) 101 Ω (b) 1000 Ω (c) 90 Ω (d) 110 Ω

60) If there are B branches and N nodes in a network, then the number of links is given by

(a) B-N (b) B-N+1 (c) B+N-1 (d) N-1

61) Time Constant of a series RL circuit equals

(a) RL (b) R/L (c) L/R (d) L/R^2

62) When two 2-port networks are connected in parallel, it is convenient to use

(a) Z Parameters (b) Y Parameters (c) h Parameters (d) ABCD Parameters

63) The relation AD-BC=1, where A, B, C, D are the elements of a Transmission matrix of a network is valid for

(a) any type of network (b) passive but not reciprocal network

(c) both passive and reciprocal network (d) both active and passive network

64) On increasing the Q-factor of a coil, its power factor

(a) increases (b) decreases
(c) remains the same (d) may increase or decrease

65) An LC circuit resonates at 2000 KHZ and has a Q-factor of 100.Find bandwidth?
(a) 10 KHZ (b) 20 KHZ (c) 200 KHZ (d) 2000 KHZ

66) When a source is delivering a maximum power to a load, the efficiency of the circuit is
(a) always 50% (b) always 75%
(c) 100% (d) depends on circuit parameters

67) Signal flow graph is used to find
(a) stability of the system (b) controllability of the system
(c) transfer function of the system (d) poles of the system

68) If the damping factor is equal to zero, then the system is called
(a) Undamped system (b) Critically damped system
(c) Under damped system (d) Over damped system

69) In the Derivative error compensation
(a) damping decreases and settling time decreases
(b) damping increases and settling time increases
(c) damping decreases and settling time increases
(d) damping increases and settling time decreases

70) The step error coefficient of a system G(s) =1/ [(s+6) (s+1)] with unity feedback is
(a) 1/6 (b) infinity (c) 0 (d) 1

71) The principles of Homogeneity and Super-position are applied to
(a) Linear time variant system (b) Non-linear time variant system
(c) Linear time invariant system (d) Non-linear time invariant system

72) In a PID Controller, which of the following is true?
i) Integral mode improves transient performance
ii) Integral mode improves steady-state performance
iii) Derivative mode improves steady-state performance
iv) Derivative mode improves transient performance
(a) (ii) and (iv) (b) (i) and (iii) (c) (ii) and (iii) (d) (i) and (iv)

73) As compared to a closed loop system, an open loop system is
(a) more stable as well as more accurate
(b) less stable as well as less accurate
(c) more stable but less accurate
(d) less stable but more accurate

74) Which of the following is an example of an open loop system?

(a) House hold refrigerator
(b) Respiratory system of an animal
(c) Stabilisation of air pressure entering into a mask
(d) Execution of a program by a computer

75) A synchro-transmitter receiver unit is a
(a) 2-phase a.c device (b) 3-phase a.c device
(c) d.c device (d) 1-phase a.c device

76) If the gain of the open loop system is doubled, then the gain margin
(a) is not affected (b) gets doubled
(c) becomes half (d) becomes one-fourth

77) In the case of ERG, what type of electrodes is used to pickup signals?
(a) Disc electrodes (b) Retinal electrodes
(c) Vacuum type electrodes (d) pH electrodes

78) For Biomedical applications, the most commonly used amplifier is
(a) Single-ended amplifier (b) Differential amplifier
(c) Inverting operational amplifier (d) Chopper amplifier

79) The heart sounds are recorded by
(a) Electro Cardiography (b) Endoscope
(c) Phono Cardiography (d) Angio Cardiography

80) The resting Potential of the inside of the neuron is about
(a) 100 μV (b) 1 mV (c) -70 mV (d) 20 mV

81) EMG deals with the
(a) study of brain activity (b) study of myocardial activity
(c) study of muscular activity (d) none of the above

82) The level of Consciousness can be followed by means of
(a) EEG (b) ECG (c) EMG (d) ERG

83) The average values of Systolic and Diastolic pressures of normal adult are
(a) 80 mm Hg and 120 mm Hg (b) 120 mm Hg and 80 mm Hg
(c) 70 mm Hg and 140 mm Hg (d) 140 mm Hg and 60 mm Hg

84) Which type of Bridge is primarily used for the measurement of frequency?
(a) Hays bridge (b) Anderson bridge
(c) Wien bridge (d) Schering bridge

85) Which method is most commonly used for the measurement of high resistance?
(a) Megohm bridge metod (b) Wheatstone bridge method
(c) Megger method (d) Direct deflection method

86) The meter constant of Energy meter is given by
(a) rev/KW (b) rev/KWh (c) rev/Watt (d) rev/KWs

87) The major cause of Creeping in an Energy meter is
(a) over-compensation for friction (b) mechanical vibrations
(c) excessive voltage across the potential coil (d) stray magnetic field

88) The deflection of Hot Wire instrument depends on
(a) RMS value of alternating current
(b) voltage
(c) average value of alternating current
(d) instantaneous value of alternating current

89) Which of the following instrument will have the same calibration on both a.c and d.c?
(a) Electrodynamometer type (b) Moving iron type
(c) Moving coil type (d) Induction type

90) A moving coil Galvanometer is made into a d.c ammeter by connecting
(a) a low resistance across the meter
(b) a high resistance in series with the meter
(c) a pure inductance across the meter
(d) a capacitance in series with the meter

91) Which Instrument transformer cannot be used for d.c measurements?
(a) Potential transformer (b) Current transformer
(c) Both (a) and (b) (d) None of the above

92) A Digital Voltmeter measures
(a) peak value (b) peak to peak value
(c) RMS value (d) average value

93) Vacuum Tube Voltmeter (VTVM) has
(a) very high ohms/volt rating (b) moderate ohms/volt rating
(c) low ohms/volt rating (d) very low ohms/volt rating

94) In a CRT, the focusing anode is located
(a) between pre-accelerating anode and accelerating anode
(b) after accelerating anode
(c) before pre-accelerating anode
(d) none of the above

95) The Horizontal Amplifier should be designed for
(a) high frequency signals with a fast rise time
(b) high amplitude signals with a slow rise time

(c) high amplitude signals with a fast rise time
(d) low amplitude signals with a fast rise time

96) Example of the Final Control Element
(a) Control valve (b) Variable speed metering pump
(c) Both (a) and (b) (d) Controller

97) In a Proportional Controller, if K_c is proportional gain of controller, then Proportional Band PB is equal to
(a) $100*K_c$ (b) $100/ K_c$ (c) K_c (d) offset

98) The control scheme in which the controller acts before the effect of disturbance has been felt by the system is
(a) Feedback control (b) Ratio control
(c) Feed forward control (d) Adaptive control

99) The Cohen-Coon method for controller tuning is also called as
(a) Ultimate cycling method (b) Ziegler-Nichols method
(c) Process reaction curve method (d) None of the above

100) The method of control that can be used to control an unmeasured process output in the presence of unmeasured disturbances is called
(a) Ratio control (b) Inferential control
(c) Adaptive control (d) Feed forward control

Computer Science (Section code 06)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$ c) Eigenvectors of A are independent

d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl$\neq$ 5 c) cl =4 d) cl$\neq$ 4

4) Sf $Z = \dfrac{x^2 + y^2}{x + y}$, then $x\dfrac{\partial z}{\partial x} + y\dfrac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\displaystyle\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\dfrac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\dfrac{dy}{dx} = \dfrac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$

c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla \phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}\ (N > 0)$ by Newton's methods is

a) $x_{n+1} = \dfrac{1}{2}(x_n + N)$ b) $x_{n+1} = \dfrac{1}{2}\sqrt{x_n + \dfrac{N}{x_n}}$

c) $x_{n+1} = \dfrac{1}{2}\left(x_n + \dfrac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \dfrac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\dfrac{1}{2}$ b) $\dfrac{2}{3}$ c) $\dfrac{1}{4}$ d) $\dfrac{3}{4}$

11) A linear list in which elements can be added or removed at either end but not in the middle, is known as

a) queue b) deque

c) stack d) tree

12) What is the time required to insert an element in a stack with linked implementations?

a) O(1) b) $O(\log_2 n)$

c) O(n) d) $O(n \log_2 n)$

13) A binary tree in which all its levels except possibly the last, have the maximum number of nodes and all the nodes at the last level appear as far left as possible, is known as

a) full binary tree b) 2-tree

c) threaded tree d) complete binary tree

14) A list of integers is read in one at a time, and a binary search tree is constructed) Next the tree is traversed and the integers are printed) Which traversal would result in a printout which duplicates the original order of the list of integers ?

a) preorder b) postorder

c) inorder d) none of the above

15) The five items: A, B, C, D and E are pushed in a stack, one after the other starting from A) The stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is

a) A b) B

c) C d) D

16) The time required to search an element in a binary search tree having 'n' elements is

a) O(1) b) $O(\log_2 n)$

c) O(n) d) $O(n \log_2 n)$

17) Consider that n elements are to be sorted) What is the worst case time complexity of Bubble sort?

a) O(1) b) $O(\log_2 n)$

c) O(n) d) $O(n^2)$

18) A complete binary tree with the property that the value at each node is greater than the values at its children is known as

a) binary search tree b) AVL-tree

c) Completely balanced tree d) Heap

19) The recurrence relation $T(n) = mT(n/2)+an^2$ is satisfied by

a) $T(n) = O(n^m)$ b) $T(n) = O(n \log m)$

c) $T(n) = O(n^{\log m})$ d) $T(n) = O(m^{\log n})$

20) The time required to find shortest path in a graph with 'n' vertices and 'e' edges is
a) O(e) b) O(n)
c) O(e^2) d) O(n^2)

21) The goal of hashing is to produce a search that takes
a) O(1)time b) O(n^2)time
c) O(log n)time d) O(n log n) time

22) In which of the following sorting algorithm, the numbers of comparisons is the minimum if the items are initially in reverse order and is the maximum if the items are in order ?
a) Straight insertion sort b) Binary insertion sort
c) Heap sort d) Bubble sort

23) Which of the following best describes sorting ?
a) accessing and processing each exactly once
b) finding the location of the record with a given key
c) arranging the data (record) in some given order
d) adding a new record to the data structure

24) Context Sensitive Grammar can be recognized by a
a) Deterministic Push Down Machine (DPDM)
b) Non Deterministic Push Down Machine (NDPDM)
c) Finite State Machine (FSM)
d) Linearly bounded memory machine

25) The class of context-free languages is not closed under
a) concatenation b) union
c) intersection d) repeated concatenation

26) Consider two regular languages L1 = (a+b)*a and L2 = b(a+b)*. The intersection of L1 and L2 is given by
a) (a+b)* ab b) ab(a+b)*
c) a(a+b)*b d) b(a+b)*a

27) Context Free Grammar is not used closed under
a) product b) union
c) complementation d) kleen star

28) The language L = {a^n, b^n , a^n where n=1,2,3,…} is a
a) regular language b) context-free language
c) non context-free d) none of the above

29) Which of the following problems is solvable ?
a) writing a universal Turing machine
b) Determining if an arbitrary Turing machine is a universal Turing machine
c) Determining if a universal Turing machine can be written in fewer than k instructions for some k
d) Determining if a universal Turing machine and some input will halt

30) Regular expression (a | b) (a | b) denotes the set

a) {a, b, ab, aa}
b) {a, b, ba, bb}
c) { a, b}
d) (aa, ab, ba, bb}

31) Which of the following regular expressions denote zero or more instances of a or b?

a) a | b
b) (a,b)
c) (a | b)
d) a*|b

32) Which of the following regular expressions denote a language comprising all possible strings of even length over the alphabet {0,1} ?

a) (0 | 1)*
b) 0 | 1 (0 | 1)*
c) (00 | 01 11 | 10)*
d) (0 | 1) (0 | 1) (0 | 1)*

33) A technique used to speed up program execution by overlapping instruction fetch is

a) bus interface unit
b) execution unit
c) pipelining
d) fetch unit

34) The 16 bit general register which is not available in the execution unit of 8086 is

a) BH
b) BX
c) BP
d) AX

35) An interrupt useful for program debugging is

a) break point
b) NMI
c) division by zero
d) debugger

36) In 8255, bidirectional handshake is possible in

a) mode 0
b) mode 1
c) mode 2
d) mode 4

37) What happens when MOV CX, DL is executed

a) copies data from DL to CX
b) Copies data from CX to DL
c) copies data from CX to DL
d) none of the above

38) An ALU execution ends up with the value 0008 H in the AX register. What will be the condition of PF & ZF

a) 1 & 0
b) 1 & 1
c) 0 & 0
d) -1 & 1

39) Multitasking is introduced in

a) 8086
b) 80286
c) 80386
d) pentium

40) A device which can be programmed to do either synchronous or asynchronous communication

a) 8251
b) 8255
c) 8279
d) 8088

41) Producer consumer problem can be solved using
a) semaphores b) event counters
c) monitors d) all of the above

42) In order to allow only one process to enter its critical section, binary semaphore are Initialized to
a) 0 b) 1
c) 2 d) 3

43) The strategy of allowing processes that are logically runnable to be temporarily suspended is called
a) preemptive scheduling b) non preemptive scheduling
c) shortest job first d) first come first served

44) Moving process from main memory to disk is called
a) scheduling b) caching
c) swapping d) spooling

45) Which of the following operating systems use write through cache
a) UNIX b) DOS
c) ULTRIX d) XENIX

46) The principle of locality of reference justifies the use of
a) Virtual memory b) interrupts
c) virtual memory d) cache memory

47) The main function of the dispatcher (the portion of the process scheduler) is
a) swapping a process to the disk
b) assigning ready process to the CPU
c) suspending some of the processes when the CPU load is high
d) bringing processes from the disk to the main memory

48) What problem is solved by Dijkstra's bankers algorithm?
a) mutual exclusion b) deadlock recovery
c) deadlock avoidance d) cache coherence

49) Which data structure is needed to convert infix notations to postfix notations ?
a) linear list b) queue
c) tree d) stack

50) Recursive procedures are implemented by
a) queues b) stacks
c) linked lists d) strings

51) A Linear list of elements in which deletion can be done from one end (front) and insertion can take place only at the other end (rear) is known as
a) queue b) stacks
c)tree d) deque

52) Consider a linked list implementation of a queue with two pointers: front and rear. What is the time needed to insert an element in a queue of length n ?

a) O(1) b) $O(\log_2 n)$

c) O(n) d) $O(n \log_2 n)$

53) Which of the following symbol table implementations has the minimum access time?

a) hash table b) search tree

c) linear list d) self-organizing list

54) Which of the following best describes sorting ?

a) accessing and processing each exactly once

b) finding the location of the record with a given key

c) arranging the data (record) in some given order

d) adding a new record to the data structure

55) The order of magnitude of the worst case performance of the linear search over N elements is

a) $N \log_2 N$ b) N

c) N^2 d) $\log_2 N$

56) The output of a lexical analyzer is

a) machine code b) intermediate code

c) a stream of tokens d) a parse tree

57) Consider a syntax directed translation scheme. If the value of an attribute of a node is a function of the attributes of its children, then the attribute is called a

a) canonical attribute b) synthesized attribute

c) inherited attribute d) none of the above

58) Consider the following left-associative operators, in decreasing order of precedence :

- subtraction (highest precedence)

* multiplication

$ exponentiation (lowest precedence)

What is the result of the following expression ?

3 – 2 * 4 $ 1 * 2 $ 3

a) -61 b) 64

c) 512 d) 4096

59) Consider the left-recursive grammar :

$S \rightarrow Aa \mid b$

$A \rightarrow Ac \mid Sd$

When the left-recursion is removed, the grammar will become equivalent to the grammar :

a) $S \rightarrow bA'$
$A' \rightarrow c \mid da$

b) $S \rightarrow Aa \mid b$
$A \rightarrow ad \mid bd \mid cA$

c) $S \rightarrow Aa \mid b$
$A \rightarrow Ac \mid Aad \mid bd$

d) $S \rightarrow Aa \} b$
$A \rightarrow bdA'$

$A' \rightarrow cA'$

60) Which of the following can be used to identify loops ?
a) depth first ordering b) reducible graphs
c) dominators d) all of the above

61) Recursive descent parsing belongs to the class of
a) predictive parsing b) top-down parsing
c) bottom-up parsing d) none of the above

62) Which of the following parsers is the most powerful ?
a) operator-precedence b) canonical LR
c) LALR d) SLR

63) In DBMS , the data dictionary refers to
a) what files are in the database b) what attributes are possessed by the data
c) what these files contain d) all of the above

64) Data integrity control
a) is used to set upper and lower limits on numeric data
b) requires the use of passwords to prohibit unauthorized access to the file
c) has the data dictionary keep the date and time of last access last back-up, and most recent modification for all files
d) none of the above

65) Primitive operations common to all record management systems include
a) print b) sort
c) look-up d) all of the above

66) A command that lets you changes one or more fields in a record is
a) insert b) modify
c) look-up d) none of the above

67) A network schema
a) restricts the structure to a one-to-many relationship
b) permits many-to-many relationships
c) stores data in tables
d) none of the above

68) In a relational schema, each tuple is divided into fields called
a) relations b) domains
c) queries d) none of the above

69) The modify operation is likely to be done after
a) Delete b) Look-up
c) Insert d) none of the above

70) An operation that will increase the length of a list is
a) Insert b) Look-up
c) Modify d) All of the above

71) Dynamic Routing is a class of Protocols to achieve which of the following?
a) Adjust routing table for load changes
b) Route around congestion and broken links
c) Reconfigure to exploit links that have recovered from failures
d) All the above

72) Which is correct with respect to a switch ?
a) When a frame on an incoming port has a destination address associated with same network segment as source station, then switch discards the frame.
b) When an address is not known to be associated to specific port, frame is forwarded on all ports except from port it received)
c) It need not receive entire frame before forwarding.
d) If address is known to be a specific port on switch, frame is forwarded)

73) Consider a machine IP address 160.80.40.20, then the 160.80 and 40.20 gives
a) host number (10260) and network number (8272)
b) network number (8562) and host number (10260)
c) host number (10212) and network number (8272)
d) network number (8272) and host number (10260)

74) A technique to inject a pulse of known shape into the cable and if the pulse hits an obstacle or end of cable and the measurement is called
a) piggybacking
b) time domain reflectometry
c) Manchester encoding
d) Frequency domain reflectometry

75) Which is not a TCP connection management state ?
a) FIN WAIT 1
b) SYN RCVD
c) CLOSING
d) TIMED ACK

76) Which one of these is relevant to UDP
a) Checksum
b) Established connection
c) No header information
d) SYN SENT state

77) To have a control over the bus until entire block of data transfer the DMA is provided with
a) hand shake mode
b) burst mode
c) data chain register
d) accretive mode

78) The 11 addressing modes in 80386 are classified into
a) immediate & memory
b) register & immediate
c) memory & direct
d) relative

79) In 80386 system if the granularity bit is one then the segment length is …….. granular
a) page
b) byte
c) bit
d) nibble

80) File record length
a) should always be fixed
b) should always be variable
c) depends upon the size of the file
d) should be chosen to match the data characteristics

81) Fragmentation of the file system

a) occurs only if the file system is used improperly
b) can always be prevented
c) can be temporarily removed by compaction
d) is a characteristic of all file systems

82) Which one of these is relevant to UDP

a) Checksum
b) Established connection
c) No header information
d) SYN SENT state

83) In a token ring network , a physical length of a bit for 1 Mbps ring whose circumference is 1000 meters can contain ....

a) 10 bits
b) 2 bits
c) 15 bits
d) 5 bits

84) Which is false with respect to Relational DataBase Systems

a) The foreign key value can be wholly null
b) Updates are allowed through views involving grouping operations
c) The determinant of a functional dependency refers to the attribute
d) Boyce- codd normal form with no multi valued dependency is 4NF

85) What is the result of the following tuple relational calculus query
Staff(S) ^ (∃B) (branch(B) ^ (B) branchNo = S.branchNo) ^ B)city = "London"

a) List all the branch tuples that has same branchNo as the branchNo of the current staff tuple and is located in London
b) List all branch tuples that is there in London
c) List all staff whose branchNo is same as branch's branchNo located in London
d) None of the above

86) The action of converting object identifiers to main memory pointers and back again is called

a) Pointer Arithmetic
b) Pointer references
c) Pointer Swizzling
d) Back pointers

87) What is wrong in the following query?

```
CREATE DOMAIN Branchname CHAR(4) CHECK (VALUE IN
        ( SELECT branchno FROM Branch));
```

a) Qualifier for attributes missing
b) AS keyword is missing
c) IN keyword is not necessary
d) Query is correct

88) Which statement is true with respect to Databases in OO architecture

a) Externalization records the state of an object as a stream of data
b) Internalization creates a new object from memory
c) Lifecycle provides operations for creating, copying, moving and deleting groups of related objects
d) Concurrency control provides a lock manager that enables multiple clients to coordinate their access to shared resources

89) A policy to ensure that all pages updated by a transaction are not immediately written to disk when the transaction commits is known as
a) Force policy b) No-force policy c) Steal policy d) Force-Writing policy

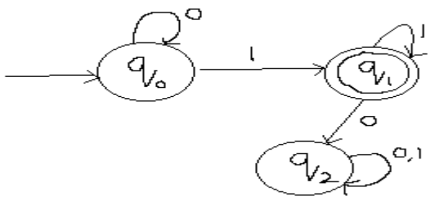
90) The concept where a model suggests the existence of a relationship between entity types, but the pathway does not exist between certain entity occurrences is called
a) Chasm traps b) Fan traps c) Entity traps d) Occurrence traps

91) What will be the order (p) of a B^+ tree with a database of 500,000 records of 200 bytes each and the search key is 15 bytes. Assume the tree and data pointers are 5 bytes and the index node (data block size) is 1024 bytes
a) 50 b) 51 c) 1024 d) 15

92) In a distributed Database design which is not a Data allocation approach
a) Centralized b) Partitioned
c) Selective replication d) None of the above

93) Which is not the objective of distributed database design
a) Partitioning of database
b) Separation of data fragmentation from data allocation
c) Control of data redundancy
d) Independence from local DBMS

94) Which is the regular expression for the following finite automata



a. 0* 1* b) 0* 1^+ c) 0* 1* 0* 1* d) 0^+ 1^+

95) Find the regular grammer for the regular expression (aa + bb)*
a) S -> aaS | bbS | ε b) S -> aa | bb | ε
c) S -> aS | bS | a | b | ε d) None of the above

96) What will be the entry in simple LR parsing table for the expression grammer for M [6 , ( ] = ?
a) shift and goto state 4 (i.e) s4 b) reduce using rule 4 (i.e) r4
c) error (i.e) no entry d) accept entry (i.e) acc

97) In the construction of syntax tree with function like mknode and mkleaf, what will be fourth step for the following expression
a – 4 + c
a) p4 = mkleaf(id , entryC) b) p4 = mknode('+' , p1,p2)
c) p4 = mkleaf(num , 4) d) p4 = mknode(' – ' , p1,p2)

98) In backpatching what does the M mean in the semantic rule for the syntax rule

$E \rightarrow E_1$ or M E_2

$E \rightarrow E_1$ and M E_2

$E \rightarrow$ not E_1

a) It refers to the index of the first statement of second expression
b) It refers to index of the first statement of first expression
c) It refers to merging of list of statements of two expressions
d) It refers to the creation of index of second statement

99) Which is not a Three Address Code?
a) if x < y goto L b) x = y [I] c) x = & y d)none of the above

100) Block structure in programming languages can be implemented using
a) Arrays b) Stacks c) Queues d) Linked lists

Chemical (Section code 07)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$ c) Eigenvectors of A are independent

d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl ≠ 5 c) cl =4 d) cl ≠ 4

4) Sf $Z = \frac{x^3 + y^3}{x + y}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\frac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\frac{dy}{dx} = \frac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$ c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}$ $(N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \frac{1}{2}\sqrt{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) Normality is defined as
(a) No.of gmole of solute/ liter of solution
(b) No.of g equivalents of solute / liter of solution
(c) Kmole of solute / kmole of solution
(d) Kmole of solute/kg of solvent

12) Which of the following is followed by an ideal solution
(a) Boyle's law
(b) Amagat's law
(c) Raoult's law
(d) Trouton's law

13) H_2S is produced from the reaction
$FeS + 2HCl \rightarrow FeCl_2 + H_2S$
120 kg of FeS react with 150kg of HCl and 0.5kmole of H_2S has been produced. The limiting reactant is

(a) FeS
(b) HCl
(c) $FeCl_2$
(d) H_2S

14) For the case of fuel gas undergoing combustion with air, if the air/fuel ratio is increased, the adiabatic flame temperature will
(a) increase
(b) decrease
(c) increase or decrease depending on the fuel type
(d) not change

15) The ultimate analysis of coal gives
(a) Carbon, hydrogen and ash
(b) Volatile matter, moisture, ash and fixed carbon
(c) Carbon, hydrogen, sulphur and nitrogen
(d) Volatile matter, moisture, nitrogen and fixed carbon

16) Combustion reaction is
(a) An endothermic reaction
(b) An exothermic reaction
(c) An autocatalytic reaction
(d) An photochemical reaction

17) Latent heat is defined as the enthalpy change involving
(a) phase change
(b) no phase change
(c) temperature change
(d) None of the above

18) With increase in C/H ratio of a fuel the amount of CO_2 formed on its complete combustion
(a) increases
(b) decreases
(c) remains same
(d) uncertain

19) Absolute humidity is defined as
(a) Kg of water vapour/kg of dry air
(b) Kg of dry air / kg of water vapour
(c) Kmole of dry air / kmole of water vapour
(d) Kmole of water vapour/kg of dry air

20) For SO_2/SO_3 service at 400 ^{0}C the recommended material of construction is

(a) Stainless steel
(b) Cast steel
(c) Carbon steel
(d) Monel

21) Catalyst used in contact process of sulphuric acid manufacture is

(a) Alumina
(b) Vanadium pentoxide
(c) Iron oxide
(d) Silicon Dioxide

22) The converter of the contact process for the manufacture of H_2SO_4, the equilibrium conversion of SO_2 _________ (i)_________ with increase in the temperature and ________(ii)__________ with increase in mole ratio of SO_2 to air
(a) (i) Increase (ii) Decreases
(b) (i) Decreases (ii) Increases
(c) (i) increases (ii) increases
(d) (i) decreases (ii) decreases

23) The ethyl alcohol content in the fermented liquor from molasses, is
(a) 50 – 55%
(b) 08 – 10%
(c) 20 – 22%
(d) 03 – 05 %

24) Sucrose is a disaccharide consisting of
(a) Glucose and glucose
(b) Glucose and fructose
(c) fructose and galactose
(d) glucose and galactose

25) Which one of the following is not likely to be constituent of vegetable oil?
(a) Citric acid
(b) Oleic acid
(c) Stearic acid
(d) Glycerol

26) A bio – degradable detergent is one which
(a) manufactured using biotechnology
(b) contains straight chain alkyl benzenes
(c) contains branch chain alkyl benzenes
(d) is easily decomposed by micro organism

27) Hydrogenation of edible oil is done to
(a) decrease the number of unsaturated bonds
(b) lower the melting point of oil
(c) increase the thermal conductivity of oil
(d) enable the oil to be packed in tin container

28) In petroleum refining, the process used for conversion of hydrocarbons to aromatics is
(a) Catalytic cracking
(b) Pyrolysis
(c) Catalytic reforming
(d) Hydrotreating

29) Filter medium must be
(a) Mechanically strong
(b) resistant to corrosive action of the fluid
(c) offer to little resistance as possible to the flow of filtrate
(d) All the above

30) Cake resistance increases steadily with the time of filtration in a plate and frame filter employing constant
(a) rate of filtration
(b) pressure filtration
(c) Both (a) and (b) above
(d) None of the above

31) In unbaffled tank, formation of vortex is not desirable because
(a) very poor mixing between adjacent layers
(b) air be easily entrained in to the liquid even at modest impeller speed
(c) the liquid level at the top edge of the tank is raised significantly
(d) all the above

32) During agitation power consumption during turbulent flow is proportional to the
(a) density of liquid
(b) viscosity liquid
(c) interface tension of liquid
(d) thermal conductivity of liquid

33) Highly Viscous liquids and pastes are agitated by
(a) Propellers
(b) turbine agitators
(c) multiple blade paddles
(d) None of the above.

34) Stokes equation is valid in the Reynolds number range
(a) 0.01 to 0.1 (b) 0.1 to 2
(c) 2 to 10 (d) 10 to 100.

35) Jigging is a technique by which different particle can be
(a) separated by particle size (b) separated by particle density
(c) separated by particle shape (d) mixed

36) For separating particles of different densities, the differential settling method uses a liquid sorting medium of density
(a) intermediate between those of the light and the heavy ones
(b) less than that of either one
(c) greater than that of either one
(d) of any arbitrary value

37) A Newtonian liquid (ρ = density, μ = viscosity) is flowing with velocity v in a tube of diameter D. Let Δp be the pressure drop across the length L. For a laminar flow, Δp is proportional to
(a) $L\rho v^2/D$ (b) $D\rho v^2/L$
(c) $L\mu v/D^2$ (d) $\mu v/L$

38) For an ideal fluid flow the Reynolds number is
(a) 2100 (b) 100 (c) Zero (d) infinity

39) Toothpaste is a
(a) Bingham plastic (b) Pseudoplastic
(c) Newtonian liquid (d) Dilatent

40) Fluidized beds are formed when
(a) fluid friction is zero
(b) gravity force is less than fluid friction
(c) pressure forces equal gravity forces
(d) sum of fluid friction and pressure forces is equal and opposite to gravity forces.

41) Stokes equation is valid in the Reynolds number range
(a) 0.01 to 0.1 (b) 0.1 to 2
(c) 2 to 10 (d) 10 to 100.

42) For the laminar flow of a fluid in a circular pipe of radius R, the Hagen- Poiseuille equation predicts the volumetric flowrate to be proportional to
(a) R (b) R^2 (c) R^4 (d) $R^{0.5}$

43) A globe valve is most suitable for applications in which
(a) the valve is required to be either fully open or fully closed
(b) flow control is required
(c) the fluid contains dispersed particles
(d) one-way flow is required

44) As the velocity V and thus the Reynolds number of a flow past a sphere increases from very low values, the drag forces for Re << 1
(a) increases linearly with V
(b) decreases linearly with V
(c) decreases as V^2
(d) none of these.

45) A spherical particle is falling slowly in a viscous liquid such that Reynolds number is less than one. Which statement is correct for this situation?
(a) Inertial and drag forces are important
(b) Drag, gravitational and buoyancy forces are important

(c) Drag force and gravitational forces are important
(d) None of the above

46) A particle attains its terminal settling velocity when
(a) gravity force + drag force = buoyancy force
(b) gravity force - drag force = buoyancy force
(c) buoyancy force + drag force = gravity force
(d) drag force = buoyancy force

47) The Colburn applies over a range of prandtl numbers from
(a) 0.5 to 50 (b) 0.46 to 590 (c) 0.006 to 0.06 (d) 120 to 590

48) Film wise condensation
a) is characterised by a thin liquid film forming over the entire surface
b) is less common than dropwise condensation
c) occurs on non wettable surfaces
d) is characterised by high heat transfer coefficients than that for drop wise condensation

49) The LMTD correction factor, F_T , is to be applied
(a) In all multipass heat exchangers
(b) In heat exchangers having more than one pass on shell side
(c) In 1-1 counter flow heat exchanger
(d) In unsteady state

50) For the two long concentric cylinders with surface areas A_1 and A_2 the view factor F_{22} is given by
(a) 0 (b) 1 (c) $1-A_1/A_2$ (d) A_1/A_2

51) Which tube configuration in a heat exchanger would result in the highest heat transfer rate
(a) square pitch
(b) diagonal square pitch
(c) triangular pitch
(d) hexagonal pitch

52) In forced convection the heat transfer depends on
(a) Re,Pr (b) Re,Gr (c) mainly Gr (d) Re only

53) Drop wise condensation occurs on
(a) clean and dirt free surface
(b) smooth clean surface
(c) contaminated cooling surface
(d) polished surfaces

54) Nucleate boiling is enhanced
(a) on polished surfaces (b) on roughened surfaces
(c) in the absence of agitation (d) none of these

55) The number of Kg vaporised per Kg of steam is fed to the evaporator is defined as
(a) capacity (b) rate of evaporation
(c) economy (d) rate of vaporisation

56) Molecular diffusivity of liquid
(a) Increases with temperature
(b) decreases with temperature
(c) May increase or decrease with temperature
(d) is independent of temperature

57) For turbulent mass transfer in pipes ,the Sherwood number depends upon the Reynolds number (Re) as
(a) $Re^{0.33}$ (b) $Re^{0.53}$ (c) $Re^{0.83}$ (d) Re

58) For stripping of a gas in a counter current stripper the operating line
(a) Lies above the equilibrium curve
(b) Lies below the equilibrium curve
(c) Can lie above or below the equilibrium curve
(d) is always parallel to the equilibrium curve

59) Penetration theory state that the mass transfer coefficient is equal to (where D_e is diffusivity and t is time)
(a) $(D_e t)^{1/2}$
(b) $(D_e / \pi t)^{1/2}$
(c) $(4D_e / \pi t)^{1/2}$
(d) $(4D_e / t)^{1/2}$

60) The surface renewal frequency in Danckwerts model of mass transfer is given by (k_L =mass transfer coefficient , m/s)
(a) $\sqrt{k^2_L D_A}$ (b) $k^2_L D_A$ (c) k^2_L / D_A (d) k_L / D^2_A

61) In distillation column design ,the McCabe Thiele procedure is in adequate and a Ponchon-Savarit procedure is needed when,
(a) Saturated feed is not used
(b) An azeotrope forms
(c) The latent heats of vaporization of the more and less volatile components are greatly different
(d) A total condenser is used

62) In binary distillation ,the separation of the components is easier if the relative volatility (α) is
(a) $\alpha >> 1$ (b) $\alpha << 1$ (c) $\alpha = 1$ (d) none of these

63) For the air water system under ambient conditions ,the adiabatic saturation temperature and the wet bulb-temperature are nearly equal ,because
(a) Water has a high latent heat of evaporation
(b) Lewis number is close to unity
(c) They are always equal under all circumstances
(d) Solubility of the components of air in water is very small

64) The Knudsen diffusivity is dependent on
(a) The molecular velocity only
(b) The pore radius of the catalyst only
(c) The molecular mean free path only
(d) The molecular velocity and pore radius of the catalyst

65) The first law of thermodynamics takes the form $W = \Delta H$ when applied to
(a) A closed system undergoing a reversible adiabatic process
(b) An open system undergoing an adiabatic process with negligible changes in Kinetic and potential energies
(c) A closed system undergoing a reversible constant volume process
(d) A closed system undergoing a reversible constant pressure process

66) A Carnot cycle consists of the following steps
(a) Two isothermal and two isentropic
(b) Two isobaric and two isothermals
(c) Two isochoric and two isobaric
(d) Two isothermals and two isochoric

67) Ideal gas law is applicable at
(a) Low T, low P (b) high T, high P (c) low T, high P (d) high T, low P

68) Entropy change for an irreversible process, taking into account both the system and surroundings together, is
(a) Positive (b) Negative (c) Zero (d) None of these

69) Which of the following is true for Virial equation of state?
(a) Virial coefficients are universal constants
(b) Virial coefficient B represents three body interactions
(c) Virial coefficients are functions of temperature only
(d) For some gases, Virial equations and ideal gas equations are the same

70) A solid is transformed into its vapor state without passing through the liquid state at
(a) Triple point (b) Boiling point (c) Always (d) Below triple point

71) Gibbs- Duhem equation provides a relationship between
(a) Composition in liquid phase and fugacity at constant temperature and pressure
(b) Composition in liquid phase partial pressure at constant temperature and pressure
(c) Composition in liquid phase and activity coefficient at constant temperature and Pressure
(d) All of the above

72) The equilibrium constant *K* for a chemical reaction depends on
(a) Temperature only (b) pressure only
(c) Temperature and pressure (d) ratio of reactants

73) For a real gas obeying van der Waals equation, $C_p - C_v$ is
(a) R (b) <R (c) >R (d) zero.

74) The dimensions of rate constant for nth order homogenous reactions are
(a). $(\text{time})^{-n}$ (b). $(\text{time})^{-1}(\text{concentration})^{1-n}$
(c). $(\text{time})^{-n}(\text{concentration})^{1-n}$ (d). $(\text{time})(\text{concentration})^{n-1}$

75) The half-life period of a first order reaction($t_{1/2}$) and the rate constant (k) are related by
(a) $t_{1/2} = k$ (b) $t_{1/2} = 2.303/k$ (c) $t_{1/2} = 0.693/k$ (d) $t_{1/2} = 7.673/k$

76) A catalyst is a substance which
(a) increases the equilibrium concentration of the product
(b) changes the equilibrium constant of the reaction
(c) shorten the time to reach equilibrium
(d) supplies the energy to the reaction.

77) For the isothermal gas-phase reaction $2A \rightarrow R$, the value of expansion factor is
(a) 1 (b) 0.5 (c) -0.5 (d) 2

78) BET apparatus is used to determine the
(a) specific surface of a porous catalyst (b) pore size distribution
(c) pore diameter (d)porosity of the catalyst bed

79) Exposure of a photographic plate to produce a latent image is an example of ___ reaction
(a) very slow (b) very fast (c) photochemical (d) both (b) & (c)

80) A reaction is of zero order when the reaction rate is

a) directly proportional to reactant concentration
b) inversely proportional to reactant concentration
c) independent of temperature
d) none of the above

81) ___ is the response curve for a step input signal from a reactor
(a) S-curve (b) C-curve (c) I-curve (d) none of the above

82) Semibatch reactor is preferred when
a) a highly exothermic reaction is to be controlled
b) undesirable side reaction is to be avoided
c) a gas is to be reacted with liquid
d) dall a, b & c

83) The offset introduced by proportional controller with gain K_c in response of rist order system can be reduced by
(a) Reducing value of K_c
(b) Introducing integral control
(c) Introducing derivative control
(d) None of the above

84) Thermocouples
(a) Have very slow speed of response
(b) Can't be connected to the measuring instrument remotely located
(c) Need cold junction compensation
(d) Are much less accurate compared to bimetallic or vapour pressure thermometer

85) Cascade control employs
(a) Two feed forward
(b) Two feedbacks
(c) One feed back and one feed forward
(d) None of these

86) Most commonly used controller for controlling the flow rates in industries is
(a) P
(b) PI
(c) PD
(d) PID

87) Optical activity of asolution can be determined using a
(a) Polarimeter
(b) Polograph
(c) Dilatometer
(d) Refractrometer

88) Thermal wells are used in temperature measurement to
(a) Guard against corrosive and oxidizing action on thermocouple materials
(b) Reduce measuring lag
(c) Increase the fidelity
(d) Increase the sensitivity

89) Which of the following relates the absorption and evolution of heat at the junction of a thermocouple to the current flow in the circuit
(a) Seebeck effect
(b) Peltier effect
(c) Joule heating effect
(d) Thomson effect

90) Gas analysis is commonly done using
(a) Thermal conductivity cell
(b) X-ray diffraction
(c) Mass spectrometer
(d) Emission spectrometer

91) Continuous measurement of moisture content of paper in paper industry is done by measuring
(a) Thermal conductivity through the paper
(b) Electrical resistance through the paper
(c) Magnetic susceptibility
(d) None of these

92) Measurement of pressure in ammonia reactor is done by
(a) Bourdon gauge
(b) U-tube manometer
(c) Inclined tube manometer
(d) Pirani gauge

93) Payback period
(a) and economic life of a project are the same
(b) is the length of time over which the earnings on a project equals the investment
(c) is affected by the variations in earnings after the recovery of the investment
(d) all *a, b* and *c*

94) Which of the following is a component of working capital investment?
(a) Process equipments
(b) Maintenance and repair inventory
(c) Utilities Plants
(d) Depreciation

95) In the straight-line method for determining depreciation, it is assumed that the value of the property
(a) Decreases exponentially with time
(b) Decreases logarithmically with time
(c) Decreases linearly with time
(d) Remains constant with time

96) When the declining balance method is used
(a) The annual depreciation cost is a fixed percentage of the property value at the beginning of the particular year
(b) The annual for depreciation is same each year
(c) The value of the asset can decrease to zero at the end of the service life
(d) The value of the asset decreases linearly with time

97) Which of the following methods results in book value greater than those obtained with the straight-line method?
(a) Declining balance method
(b) Sum-of-the-years-digits method
(c) Sinking fund method
(d) Multiple straight-line method.

98) A balance sheet for an industrial concern shows
(a) the financial condition at any given time
(b) only current assets
(c) only fixed assets
(d) only current and fixed assets

99) For a given fluid, as the pipe diameter increases, the pumping cost
(a) Decreases
(b) Increases
(c) remains the same
(d) may increase or decrease depending upon whether the fluid is Newtonian or non-Newtonian.

100) Payback method for measurement of return on investment
(a) Gives a correct picture of profitability
(b) Underemphasizes liquidity
(c) Does not measure the discounted rate of return
(d) Takes into account the cash inflows after the recovery of investments

Bio Technology (Section code 08)

1) A slippery outer covering in some bacteria that protects them from phagocytosis by host cells is
(a) Capsule (b) cell wall (c) Flagellum (d)Peptidoglycan

2) A bacterial cell wall does all of the following except
(a) Gives shape and rigidity to the cell
(b) is the site of action for some antibiotics
(c) is associated with some symptoms of disease
(d) Protects the cell from phagocytosis

3) Which of the following contains polysaccharide?
(a) Gram negative cell wall (b) Pili (c) Flagella (d) Plasmids

4) Flagella and pili are made of
(a) Lipids (b) Carbohydrates (c) Nucleic acids (d) Protein

5) When flagella are located around the entire bacterial cell, the arrangement is called
(a) Polar (b) Random (c) Bipolar (d) Peritrichous

6) An encapsulated cell will reproduce to form colonies that appear
(a) Nonpathogenic (b)Translucent (c) Pink (d) Smooth

7) Energy is stored in the ATP (adenosine triphosphate) molecule in its
(a) Sugar portion (b) Adenine portion
(c) Third phosphate bond (d) none of the above

8) Organisms that ferment glucose may produce any of the following end products except
(a)Lactic acid (b) Propionic acid (c) Alcohol (d) Oxygen

9) The bacterial envelope includes all of the following structures except –
(a) Capsule (b) Cell wall (c) Cell membrane (d) Endospore

10) Outer membrane proteins are present in:-
(a) Gram –positive bacteria (b) Gram – negative bacteria
(c) Mycoplasmal membranes (d) Tonoplast membranes

11) 9+2 fibrillar arrangement is present in
(a) Bacterial flagella (b) Bacterial fimbriae
(c) Eukaryotic flagella (d) T4 bacteriophage

12) DNA duplication occurs in
(a) Mitosis only (b) Meiosis only
(c) Meiosis I and mitosis (d) Meiosis II and mitosis

13) Blast cells are:-

(a) Precursors of mature cells (b)Cells that blast
(c) Transformed cells (d)Enucleated cells

14) The (OH^{-}) concentration of 0.01N HCL solution is:-

(a) $1x10^{-8}$g mol per litre (b)$1x10^{-10}$g mol per litre
(b) $1x10^{-12}$ g mol per litre (c)$1x10^{-14\,g}$ mol per litre

15) The sites of oxygen evolution and photophosphorylation in chloroplast are:-

(a) Grana stacks (b)Matrix
(b) Inner wall of chloroplast (d)Surface of chloroplast

16) Which one of the following inhibits the release of insulin from ß cells of islets of langerhans?

(a) Hyperglycemia (b) Elevated levels of norepinephrine
(c) Elevated levels of arginine (d) Elevated levels of Glucagon

17) Galactosemia is due to the deficiency of

(a) Glucose-6-phosphatase (b)Phosphogalactose uridyl transferase
(c) Glucokinase (d) Phosphoglucomutase

18) Deficiency in the secretion of hormone from the thyroid gland leads to :

(a) Sluggishness and Growth retardation
(b) High blood pressure
(c) Delayed development of secondary sex characteristics
(d) Defective carbohydrate metabolism

19) Tissue engineering involves utilization of

(a) Mesenchymal stem cells (b) Biomaterials
(c) Growth factors (d) All the above

20) Nanomaterials can be used in

(a) Tissue engineering (b) Cancer cell imaging
(c) Controlled drug delivery (d) All the above

21) Bone marrow can give rise to

(a) Mesenchymal stem cells (b) Embryonic stem cells
(c) Totipotent stem cells (d) Unipotent stem cells

22) Nucleosome contains

(a) DNA (b) histones
(c) DNA and histones (d) non histones

23) Gene silencing can be obtained by

(a) siRNA (b) micro RNA (c) antisense RNA (d) all the above

24) DNA is transcribed by RNA polymerase into

(a) RNA (b) DNA (c) Protein (d) Gene

25) The enzyme involved in RNA transcription is

(a) RNA polymerase X (b) RNA polymerase II

(c) RNA polymerase V (d) DNA polymerase

26) Gene expression can be altered by

(a) Knock out (b) Knock in

(c) Over expression (d) All the above

27) The transduction means introducing DNA into mammalian cells by

(a) Lipids (b) Virus (c) Polymers (d) Plasmid

28) mRNA may have

(a) poly (T) tail (b) poly (G) tail

(c) poly (A) tail (d) poly peptide

29) RNA splicing involves removal of

(a) Exons (b) Introns (c) Promoters (d)Histones

30) RNA can be degraded by

(a) DNAse (b) RNAse (c) Proteinase (d) Transferase

31) A sensitive method to quantify expression of mRNAs is

(a) Real time RT-PCR (b) Western blot

(c) Northern blot (d) Nested PCR

32) Proteins can be separated by

(a) Northern blot (b) Western blot

(c) Southern blot (d) Agarose gel

33) Protein phosphorylation is mediated by

(a) Kinases (b) Phosphatases (c) Proteases (d) Lipases

34) A nucleoside consists of:

(a) A pentose sugar and a nitrogeneous heterocyclic base.

(b) A pentose sugar and a oxygen base.

(c) A hexose sugar and a nitrogeneous heterocyclic base.

(d) A phosphate group, a pentose sugar and a nitrogeneous heterocyclic base.

35) A DNA strand has the sequence A-C-A-G-C-C-G-T-A. What would be its complementary strand?

(a)T-G-T-C-G-G-C-A-T (b) A-C-A-G-C-C-G-T-A

(c) U-G-U-C-G-G-C-A-U (d) G-T-G-A-T-T-A-C-G

36) The number of hydrogen bonds that hold the Adenine - Thymine base pair together is

(a) 2 (b) 3 (c) 4 (d) 5

37) The DNA molecules of different species differ in their:

(a)Phosphate backbone (b) Sequence of bases
(c) Type of nucleotides (d) All of the above

38) Because one original strand of the double stranded DNA helix is found in each daughter cell (after cell division), the DNA replication process is:

(a) Semiconservative (b) Conservative
(c) Derivative (d) Dispersive

39) When tryptophan is present in the medium, the transcription of tryptophan producing genes in E. coli is stopped by a helix-turn-helix regulator binding to the

(a) trp operator (b)trp repressor
(c) trp polymerase (d)trp promoter

40) In order for a gene to be transcribed, RNA polymerase must have access to the DNA helix and be able to bind to the genes

(a) Activator (b) Regulator (c) Promoter (d)Operator (e)Repressor

41) The most common form of gene expression regulation in both bacteria and eukaryotes is

(a) Translational control (b) Transcriptional control
(c) Post-transcriptional control (d) Control of passage from the nucleus

42) E. coli is able to use foods other than glucose in the absence of available glucose, because falling levels of glucose cause an increase of

(a) cAMP (b)Lactase (c) Glu operons d) tRNA

43) Which of the following is part of an operon?

(a) Structural genes (b)a CAP binding site
(c) An operator (d) All of the above

44) If the uracil content is exhausted, the following process will immediately stop:

(a) Reverse transcription (b) Transcription
(c) Replication (d) Translation

45) The enzyme catalyzing the binding of Alanine to its tRNA is called:

(a) Alanine-tRNA polymerase (b)Alanine-tRNA transferase
(c) tRNA-Alanyl polymerase (d)Alanyl-tRNA synthetase

46) Shine-Dalgarno sequence is:

(a) Found at the 3′ end of a prokaryotic gene
(b) Found in 16S rRNA

(c) Complementary to an mRNA sequence
(d) Located upstream of the AUG initiation codon of a prokaryotic mRNA

47) The sequence of bases located prior to the gene (along the DNA strand), to which a complex of RNA polymerase and sigma factors attaches itself to initiate transcription is called:

(a) Promotor (b) Terminator (c) Exon (d) Telomere

48) Which of the following is not part of RNA processing in eukaryotes?

(a) Addition of 5′ cap (b)Intron removal
(c) Addition of poly A tail (d) Reverse transcription

49) In recombinant DNA technology, a selected gene is removed from an animal, plant, or microorganism, and is inserted into what?

(a) A primer (b)A palindrome (c) A vector (d)A cloning host

50) A method used to distinguish DNA of one individual from another is

(a) Polymerase chain reaction
(b) c DNA
(c) Reverse transcriptase
(d)Restriction fragment length polymorphism.

51) Why is DNA polymerases from thermophilic organisms used in the polymerase chain reaction?

a) Because they are required to keep the two strands separated
b) Because they cannot add new nucleotides at low temperatures
c) Because they are easier to isolate than psychrophilic DNA polymerases
d) Because the priming and extension steps must be carried out at high temperatures to prevent the single strands from reannealing

52) In the Sanger method of DNA sequencing, what causes the termination of chain elongation?

(a) The incorporation of a regular DNA nucleotide
(b) Denaturation of the double-stranded test fragments
(c) The incorporation of a dideoxynucleotide
(d) When the DNA polymerase encounters a stop codon

53) The technique that utilizes probes to detect specific DNA sequences is known as what?

(a) Southern blot (b) Western blot
(c) Eastern blot (d) Northwestern blot

54) The insertion of a cloning vector into a cloning host typically involves what process?

(a) Polymerase chain reaction (b) Transformation
(c) Hybridization (d) Conjugation

55) Transgenic microorganisms have been used to improve or benefit all but which of the following?

(a) Meat yield (b) Medical diagnosis

(c) Crop improvement (d) Bioremediation

56) Genetically identical organisms derived from a single genetic source are called

(a) Populations (b) Varieties (c) Sibling species (d) Clones

57) Why does the Environmental Protection Agency closely monitor the release of transgenic bacteria used for agricultural purposes?

(a) They want to monitor the destruction of crops by the GMOs.

(b) They want to observe the effect the GMOs have on crops.

(c) They want to ensure the GMOs do not proliferate in the environment and pose a threat to humans.

(d) They want to ensure that people are aware that GMOs may have played a role in the production of a particular food product.

58) Which of the following is not an application of genetic engineering in plants?

(a) Nitrogen fixation

(b) DNA vaccines

(c) Resistance to glyphosate

(d) Production of insecticidal proteins in plants

59) For an enzyme that displays Michaelis-Menten kinetics, the reaction velocity (as a fraction of V_{max}) observed at [S] = 2, K_M will be

(a) 0.09 (b) 0.33 (c) 0.66 (d) 0.91

60) The Monod-Wyman-Changeoux ("concerted") model for cooperativity cannot account for

(a) Heterotropic interactions

(b) Negative cooperativity

(c) Non-integral values of n_H

(d) Positive cooperativity in enzyme kinetics

61) Why is the Lineweaver-Burk plot important in enzyme kinetics?

(a) It reveals the presence of organic prosthetic groups in enzymes.

(b) It is a single-reciprocal plot.

(c) It makes it easier to determine *V*max.

(d) It illustrates enzyme specificity.

62) Enzyme Inhibition may be reversed by

(a) EDTA (b)Citrate

(b) Both A and B (d)None of the above

63) Which of the following procedures uses a photocell to measure absorbance of a culture to regulate the flow of culture media?

(a) Chemostat (b) Trubidostat

(c) Hemostat (d) Petroff-Hausser chamber

64) When the medium contains more than one carbon source, the phenomenon is

(a) Balanced growth (b) Diauxic growth
(c) Unbalanced growth (d) All the above

65) An unstructured model assumes

(a)Fixed cell composition (b) Balanced growth
(c) Pseudo balanced growth (d) Both A and B

66) Growth Modelling by multiple substrates is referred to as

(a) Cybernetic approach (b) Structured approach
6. Unstructed approach (d) Chemostat approach

67) For the Monod equation, which parameter is incorrectly identified?

(a) μ_{max} = maximum growth rate
(b) K_s = monod coefficient
(c) μ = growth rate
(d) S = substrate type

68) In the Michaelis-Menten kinetics, at $2V = V_{max}$, the relation between K_m and S is given by:

(a) $K_m = 2S$ (b) $K_m = S/2$
(c) $K_m = S/4$ (d) $K_m = S$

69) Identify the right units for reaction rate constant from the given list:

(a) $mol^2 * L^{-2} * sec^{-1}$ (b)$L * mol^{-2} * sec^{-1}$
(c) $L^2 * mol^{-2} * sec^{-1}$ (d) $L^2 * sec * mol^{-2}$

70) Which statement is true for an enzyme?

(a) Enhances the rate of the reaction and does not affect the equilibrium
(b) Affects the equilibrium but does not affect the reaction rate.
(c) Enhances the reaction rate, but also affects the equilibrium concentration of products and reactants.
(d) Does not affect kinetics and thermodynamics of the reaction.

71) Which of the following cases are likely to lead to faster rates of catalysis by an enzyme immobilized on a negatively charged support?

(a) A positively charged substrate and a negatively charged product
(b) A negatively charged substrate and a positively charged product
(c) A positively charged substrate and a positively charged product
(d) None of the above

72) Which one of the following technique is NOT ideal for immobilized cell free enzyme?

(a) Physical entrapment by encapsulation
(b) Covalent surface bonding to surface carriers
(c) Physical bonding to surface carriers
(d) Covalent chemical bonding by cross-linking the precipitate

73) In fermentors, as the rate of aeration increases, the bubble size:

(a) Increases
(b) Stays consistent
(c) Becomes inconsistent
(d) Decreases

74) The microbial death kinetics constant is given by the equation: (k_d is death kinetics rate constant and k_o is arrhenius constant, R is universal gas constant, T is absolute temperature and E is the activation energy)

(a) $k_d = k_o e^{E/RT}$
(b) $k_o = k_d e^{-E/RT}$
(c) $RT \ln\left(\frac{k_o}{k_d}\right) = -E$
(d) None of the above

75) Which of the following is essential in an industrial scale aerobic fermentation:

(a) Oxygen is supplied along with the media and there is no further requirement for oxygen
(b) Mixing with an impeller is adequate to insure proper aeration
(c) Heat needs to be provided to maintain the temperature
(d) cooling is necessary to maintain temperature

76) The main function of the sparger in industrial scale fermentor is to:

(a)Introduce small air bubbles to help areate the medium
(b)Add sterile nutrients
(c)Aid the cooling of the fermentor
(d) Introduce steam in the fermentor during sterilization

77) In secondary metabolism two distinct phase trophophase and idiophase refer respectively to:

(a) Growth and production phase
(b) Early and late phases
(c) Primary and secondary metabolism
(d) Lag phase and log phase

78) The precursor molecule for penicillin-G biosynthesis during fermentation process is:

(a) Phenyl acetic acid
(b) Phenoxyacetic acid
(b) Acetic acid
(d) None of these

79) The solubility of oxygen drops significantly:

(a) at 10 ^{o}C
(b)at 40 ^{o}C
(c) Above 40 ^{o}C
(d)Below 40 ^{o}C

80) For scaling up of a bioreactor, the following parameter is assumed to be constant:

(a) Airflow rate
(b) Diameter of the impeller
(c) Agitator tip speed
(d) Volumetric mass transfer coefficient

81) The $\Delta G^{o\prime}$ of a catabolic reaction is:

(a) Positive (b)Negative
(d) Zero (d)Depends on the reaction conditions

82) An endergonic reaction:
(a) Proceeds spontaneously (b) Does not require activation energy
(c) Overall requires energy (d) Requires an enzyme

83) Which of the following has not been used in bioconversions?
(a) Unicellular bacteria (b)Actinomycetes
(c) Yeasts (d) Virus

84) The use of microorganisms to carry out specific chemical is termed
(a)Biosynthesis (b) Bioconversion
(c) Biotransformation (d) All of the above

85) Two proteins have same molecular weight but differ in their amino acid composition. They can be separated by:
(a) Reverse phase chromatography (b)Gel filtration
(b) Ion-exchange chromatography (d)Hydrophobic chromatography

86) Ultrafilration process cannot be used for:
(a) Fractionation of protein (b)Desalting of proteins
(c) Harvesting of cells (d) Selective removal of solvents

87) An enzyme solution is centrifuged and high concentration of ammonium sulfate is added. What is observed immediately?
(a) Crystallization of enzyme occurs
(b) The solution color changes to blue
(c) The enzyme particles dissolve completely
(c) The OD of the solution decreases

88) Which of these is an imino acid:
(a) Glutamic acid (b)Proline (c)Tryptophan (d) Threonine

89) Trypsin is a protease that specifically cleaves at the C-terminus of:
(a)Hydrophobic residues (b) Basic residues
(c) Lysine and arginine residues (d) Tyrosine residues

90) Which two systems work with the skeletal system to cause a finger to move?
(a) Immune and excretory (b) Digestive and respiratory
(c) Nervous and muscular (d) Circulatory and integumentary

91) All of these should be considered when storing acids EXCEPT the –
(a) Correct labeling of chemicals (b)Safety of people in the building
(c)Shape of the storage containers (d)Separation of incompatible chemicals

92) In order for a species to survive, it must be able to

(a) Consume a wide variety of food

(b)Reproduce successfully

(c) Maintain a constant body temperature

(d)Destroy competing species

93) Anton van Leeuwenhoek is credited with developing the first microscope. Which theory of biology was a direct result of Leeuwenhoek's work?

(a) The theory of natural selection

(b) The Gaia theory

(c) The theory of independent assortment

(d) The cell theory

94) Edward Jenner helped control smallpox by developing the process of —

(a) Jennerization (b)Pasteurization

(c) Flagellation (d) Vaccination

95) Which organelle has the most control over a cell's functions?

(a) Cell membrane (b)Ribosomes

(c) Nucleus (d) Mitochondria

96) The pineal gland produces melatonin during periods of darkness. Which of these events supports the hypothesis that infants begin producing melatonin at about three months of age?

(a) Infants begin to roll over.

(b) Infants nap for three hours each afternoon.

(c) Infants grasp at moving objects.

(d) Infants start sleeping through the night.

97) The immunofluorescence test can be used to identify

(a) Protein molecules and polysaccharide molecules

(b) Lipid molecules and nucleic acid molecules

(c) Antibody molecules and antigen molecules

(d) Cytoplasmic molecules and cell wall molecules

98) The terminator and promoter regions functioning in protein synthesis exist on the

(a)Endoplasmic reticulum (b)DNA molecule

(c) Ribosome (d) Nuclear membrane

99) CD4 and CD8 are markers of

(a) T lymphocytes (b)Chloroplasts

(c) Macrophages (d) B lymphocytes

100) Macrophages and dendritic cells belong to

(a)Both innate and humoral immunity (b) Innate immunity

(c) Acquired immunity (d) Both innate and acquired immunity

GIS (Section code 09)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$ c) Eigenvectors of A are independent

d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$
$7x + 3y - 2z = 8$
$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl ≠ 5 c) cl =4 d) cl ≠ 4

4) Sf $Z = \frac{x^3 + y^3}{x + y}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\frac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\frac{dy}{dx} = \frac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$ c) $y = x^2 + c$ d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k},$ then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}\ (N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \frac{1}{2}\sqrt{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) The art of obtaining information about an object on earth surfaces without being in physical contact with it is known as

a) Photogrammetry
b) Optics
c) Remote sensing
d) Satellite Imaging

12) Photogrammetry is a

a) Advanced Surveying
b) Irrigation of Hydrology
c) Analysis of Structural
d) None of the above

13) The Photographs used in Photogrammetry are

a) Aerial Photos and Terrestrial Photos
b) Color photos
c) B&W photos
d) Color and B& W Photos

14) Application of Photogrammetry particularly in urban management is

a) Road Alignment
b) Height of the building
c) Delineation of boundary of buildings
d) All the above

15) Stereo pair Images are generated by

(a) Overlapping two Images
(b) Non-Overlapping two Images
(c) Over-lapping 3-Images
(d) None of these above

16) The degree of tilt in a tilted photograph is

a) 1˚ to 3˚
b) 1˚ to 7˚
c) 1˚ to 6˚
d) 1˚ to 5˚

17) -----------controls the amount of light entering the photographic camera

a) Lens
b) Shutter
c) Aperture
d) Diaphragm

18) The aerial Photogrammetry is used for Non-Engineering applications like

a) Soil Maps of Geological
b) Tax Maps of Forest map
c) Astronomy of Archaeology map
d) All of the above

19) The radial displacement of the image visible on the vertical photograph due to topography is known as

a) Vertical distance
b) Relief displacement
c) Relief distance
d) Relief difference

20) The art and science of mapmaking is known as

a) Remote sensing
b) GIS
c) GPS
d) Cartography

21) The art and science of recording, measuring and interpreting photographs is known as

a) Remote sensing
b) Photogrammetry
c) Cartography
d) None of the above

22) The point on the ground coinciding with the optical axis of the camera is known as

a) Principle point
b) Fiducial point
c) Nadir
d) Floating mark

23) Orthophotos are

a) Photographs without distortions
b) Photographs with distortions
c) Photographs with relief displacement
d) Photographs with tilt

24) Ground control points in Photogrammetry are used for

a) Interior orientation
b) Exterior orientation
c) Absolute orientation
d) Relative orientation

25) Scale is defined as ratio between

a) Distance on ground by distance on MAP
b) Distance on Map by Distance on ground
c) Distance on the ground and airways
d) None of the above

26) Relief displacement means

a) Change in Height
b) Change Shape
c) Change in Size
d) All

27) Uses of Stereoscope

a) Elimination of Parallax
b) Getting 3D-view
c) Exact Projection of Height visualized
d) All the above

28) Titled photogrammetry requires

a) Geometric Correction
b) Linear Correction
c) Angular Correction
d) All

29) In a photo theodolite, the camera is

a) Below the telescope.
b) Above the telescope.
c) Below and above telescope
d) Attached with any one of the telescope side

30) The system for referring locations on the earth is known as

a) Projections
b) Coordinate system
c) Datum
d) Ellipsoid

31) Three visible colors in EMR are

a) Black, White & Red
b) White, Red & Blue
c) Black, White & Green
d) Red, Green & Blue

32) The propagation of Energy from sun through atmosphere is called

a) Electromagnetic waves.
b) Light waves.
c) Sound waves.
d) Sea weaves.

33) The type of scattering in which the wave length of incoming radiation is greater than atmospheric particles is called

a) Mie Scattering.
b) Rayleigh scattering.
c) Atmospheric windows.
d) Non-selective scattering

34) One wave length is equal to

a) 0 to 360^0
b) 0 to 90^0
c) 0 to 180^0.
d) 0 to 270^0

35) The wave length range of television waves are

a) 0.4 to 0.7 μm.
b) >30 cm
c) 0.03 to 0.04 m.
d) 0.01m to 0.07 m.

36) In the presence of atmospheric particles and scattering, the sky would appear

a) White color
b) Blue color
c) Orange color
d) Black color

37) Portions of EMR which have high absorption range present in

a) Vegetation.
b) Water bodies.
c) Open spaces.
d) All the above.

38) EMR energy neglected from the surface objects is called

a) Reflection.
b) Transmission.
c) Absorption.
d) Emission.

39) When the EMR interacts with dry soil condition

a) Reflection is more
b) Reflection is less
c) Reflection is equal
d) Reflection and absorption is equal.

40) The velocity of wave in space

a) 4×10^3 m/s
b) 5×10^3 m/s
c) 2×10^8 m/s
d) 3×10^8 m/s

41) The distance can be measured electronically by the instruments called

a) Tachometer.
b) Theodolite.
c) EDM.
d) Clinometer's.

42) The instruments used to measure distance and angle electronically and display

a) GPS.
b) Total station.
c) Compass.
d) Theodolite

43) The instruments used to measure Latitude, Longitude and Altitude of the object on the Earth's surface are

a) GPS.
b) Clinometers.
c) Compass.
d) Total station

44) The wave used for total station instruments is

a) Laser and Infrared
b) Radio wave.
c) Television wave.
d) Micro wave

45) A ratio between the velocities of wave in vacuum condition to any medium is called

a) Refractive Index
b) Velocity Index
c) Wave Index
d) All the above

46) The art of determining the relative position in between the objects on the earth surface is called

a) Remote Sensing.
b) GIS.
c) Photogrammetry.
d) Surveying.

47) Remote sensing technique is precision and time consuming but costly, because of

a) if apply in small areas
b) Processing software is costly
c) Large scale map cannot be prepared
d) All the above

48) It is a method of collecting and interpreting information about terrain and other objects from a distance without being in physical contact.

a) Geology.
b) Geophysics.
c) Remote Sensing.
d) Geography.

49) It operates in the microwave and radio bands of EMR.

a) Radar.
b) Camera.
c) GPS.
d) All the above

50) Vehicle to carry the sensor is

a) Sensor setup
b) Platform
c) Detector
d) All the above

51) Remote Sensing data can be analysed through the technique of

a) Digital signal processing.
b) Computer image processing
c) Digital image processing.
d) Computer valid processing.

52) GPS stands for.

a) Global Positioning System.
b) Geographical Positioning System.
c) Geological Positively System.
d) None of these.

53) Application of Remote Sensing in the fields

a) Hydrological.
b) Geological.
c) Environmental.
d) All the above.

54) Remote Sensing techniqueis not applicable for

a) Below the earth
b) Below the river
c) Below the sea.
d) All the above.

55) Abbreviation for GIS

a) Geographical Information System.
b) Geological Information System.
c) Geo-Physic Information System.
d) None of these.

56) The first earth resource satellite launched by USA

a) Earth Resources Technology Satellite
b) Environmental Research Technology Satellite
c) Ecology Research Technology Satellite
d) None of these

57) EDUSAT launched by India, deals with

a) Education
b) Economic
c) Environment
d) Ecology

58) Indian first satellite for earth resources

a) IRS – 1A
b) INSAT – 1A
c) SPOT
d) IKONOS

59) INSAT group of satellites deals with

a) Agricultural data
b) Land use data
c)Urban planning
d) Meteorological data

60) SAR refers to

a) Synthetic Aperture Radar
b) Side Aperture Radar
c)Solar Aperture Radar
d) None of these

61) Population data is a type of

a) Attribute data
b) Spatial data
c) Vector data
d) Measurable data

62)Which of the following is not a data structure?

a) Hierarchal
b) Relational
c) Network
d) Overlay

63)Parent-Child data relationship database is known as

a) Relational
b) Hierarchal
c) Network
d) All the above

64)Which of the following is not the data input technique for computer ?

a) Scanning
b) Digitizing
c) Printing
d) All the above

65)Name of the primary storage device in computer :

(a) CD.
(b) Floppy.
(c) Rom.
(d) None of these.

66)Which of the following is not a map overlay technique?

a) Point in polygon
b) Line in polygon
c) Point in line
d) Polygon in polygon

67)Number of databases connected and management by single system is called

a) Relational database management system
b) Common database management system
c) Interlinking database management system
d) Database Manipulation Software

68)In database management system ODBC refers to
(a) Orientated Database Connection
(b) Open Database Connectivity
(c) Oracle Database Connectivity
(d) None of these

69)RAM means,
(a) Random Access Memory.
(b) Read and Memory.
(c) Random and Memory.
(d) None of these.

70) What is the chance that a leap year selected at random will contain 53 Sundays?
a) 2/7
b) 7/2
c) 3/7
d) 7/3

71) In database management system DDL refers to
(a) Data Distribution Language
(b) Detailed Data Language
(c) Data Definition Language
(d) None of these

72) Triggers is an SQL function which initiates the action of
(a) Insert
(b) Delete
(c) Update
(d) All the above

73) Input device in computer
(a) Monitor.
(b) Keyboard.
(c) Printer.
(d) None of the above

74) Translating from one language to another language in database is called
(a) Date Distribution
(b) Data Translation
(c) Data encoding
(d) All the above

75) MS office consists of

(a) MS word
(b) MS Excel
(c) MS Powerpoint
(d) All the above

76) Surveying principles involve
(a) Triangulation
(b) Trilateral
(c) Both a and b
(d) Newton's law

77) Watershed management is.
a) To conserve the water
b) To conserve the soil
c) To conserve the soil and water
d) None of the above

78) Soil Erosion by raindrops is called.
a) Rill erosion
b) Inter –rill erosion
c) Splash erosion
d) Sheet erosion

79) The spacing between the wells (well interface) is roughly estimated under the hard rock areas
(a) 100 – 200 m
(b) 200 – 300 m
(c) 300 – 400 m
(d) 400 – 500 m

80) The ground surface is interms of irregular elevation and depressions refers to
a) Topography.
b) Geography.
c) Geology.
d) Land forms.

81) Marble is a type of
a) Volcanic rock
b) Plutonic rock
c) Sedimentary rock
d) Metamorphic rock

82) Evaporation is measured by
a. Infiltrometer
b. Pan-Evaporimeter
c. Iso-heights
d. None of these.

83) Kharif season falls on which duration ?

a. Jan-May.
b. Oct-April.
c. June-Sept.
d. March-October.

84) Hydrological cycle consists of

a. Precipitation
b. Evaporation
c. Transpiration
d. All of these

85) Hydrograph is related to

a. Rainfall vs Time.
b. Rainfall vs Runoff.
c. Runoff vs Time.
d. All the above.

86) Detachment of soil particles due to action of wind and water is referred to as

a. Soil Erosion
b. Soil Sedimentation
c. Siltation
d. All the above

87)Rainfall measured by the instruments of

a. Rainfall collector
b. Rainfall meter
c. Simen Raingauge.
d. All the above.

88) Which of the following materials has the highest porosity?

a. Clay
b. Silt.
c. Sand
d. Gravel

89) Catchments of water bodies are located in

a) Down stream side
b) Up stream side
c) Both includes up and down stream sides
d) Part of the down stream side

90) It is a slow or sudden downhill movement of slope forming surface materials under the force of gravity.

a. Earth Quake
b. Tsunami
c. Land Slide
d. All the above

91) Contours are drawn by.

(a).Joining rain gauge stations.

(b) Drawing equal angles.
(c) Drawing lines of equal elevations.
(d) Drawing lines of equal precipitation depth for a given numbers.

92) Infiltration is measured by.
(a) Infiltrometer.
(b) Lysimeter
(c) Filtration techniques
(d) All the above

93) ___________ is the process of water convert from liquid state to vapour state
(a) Evaporation
(b) Transpiration
(c) Evapotranspiration .
(d) Rainfall

94) The potential ability of groundwater depends on
(a) Aquifer condition
(b) Soil porosity
(c) Soil permeability
(d) All the above

95) In watershed average rainfall can be estimated from the rainguages stations using the method of
(a) Thiessen polygon method
(b) Arithmetic mean method
(c) Isohyets method
(d) All the above

96) A aquifer which is located in between impervious layer is called
(a) Unconfined aquifer
(b) Confined aquifer
(c) Semi-Confined aquifer
(d) All the above.

97) The Rainfall starts to surface runoff at the condition of.
(a) Soil saturation capacity
(b) Soil Field capacity
(c) Soil micro pores filled by water.
(d) None of the above

98) In agriculture the remote sensing technique can be applied for
(a) Yield forecasting
(b) Crop differentiation
(c) Crop condition

(d) All the above

99) Wind erosion is caused by.

(a) Storms of high intensity.
(b) Mismanagement of land resources
(c) Type of soil
(d) All the above

100) Soil Erosion by flow of runoff water is called

(a) Rill erosion
(b) Inter –rill erosion
(c) Splash erosion
(d) Sheet erosion

Environmental (Section code 10)

1) Rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ is

a) 1 b) 2 c) 3 d) 4

2) A square matrix A=(aij)nxn can be diagonalised only when

a) $|A| = 0$ b) $|A| \neq 0$ c) Eigenvectors of A are independent

d) Eigenvectors of A are dependent.

3) System of equations $2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$ have unique solution if

a) cl =5 b) cl ≠ 5 c) cl =4 d) cl ≠ 4

4) Sf $Z = \frac{x^3 + y^3}{x + y}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to

a) Z b ½ Z c) 2Z d) 0

5) $\int_0^{\frac{\pi}{2}} \log \tan x \, dx$ is equal to

a) $\frac{\pi}{2}$ b) log 0 c) 1 d) zero

6) Solution of the differential equation $\frac{dy}{dx} = \frac{x^2 - y}{x}$ is

a) $xy = x^3 + 3c$ b) $3xy = x^3 + c$ c) $y = x^2 + c$

d) none of the above

7) If $f(z) = u + iv$ is analytic, then $f^1(z)$ is equal to

a) $u_x - iv$ b) $u_x + iv$ c) $u_x - iv_y$ d) $u_x + iv_x$

8) If $\nabla\phi = yz\bar{i} + zx\bar{j} + xy\bar{k}$, then ϕ is equal to

a) $xyz + c$ b) $(xy + yz + zx)$ c) $x^2y^2z^2 + c$ d) $x + y + z + c$

9) Iteration formula to compute $\sqrt{N}\ (N > 0)$ by Newton's methods is

a) $x_{n+1} = \frac{1}{2}(x_n + N)$ b) $x_{n+1} = \frac{1}{2}\sqrt{x_n + \frac{N}{x_n}}$

c) $x_{n+1} = \frac{1}{2}\left(x_n + \frac{N}{x_n}\right)$ d) $x_{n+1} = \left(\sqrt{N} + \frac{1}{2}x_n\right)$

10) Two coins are tossed probability of getting atleast one head is

a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{4}$ d) $\frac{3}{4}$

11) Only about _____% of the world's total water supply exists as uncontaminated fresh water on or close to the surface and readily available for human use.
(a) 0.0003
(b) 0.003
(c) 0.03
(d) 0.3

12) The hydrologic cycle will naturally purify and recycle fresh water as long as humanbeings don't
(a) pollute the water faster than it is replenished.
(b) withdraw it from groundwater supplies faster than it is replenished.
(c) overload it with slowly degradable and nondegradable wastes.
(d) all the above

13) During which of the following does water move in a direction different from the others?
(a) percolation
(b) transpiration
(c) infiltration
(d) precipitation

14) Porous water-saturated layers of underground rock are known as
(a) aquifers.
(b) recharge areas.
(c) watersheds.
(d) runoff areas.

15) Throughout the world, the most water is used for________________and the least amount is used for ____________________
(a) irrigation; public use
(b) industrial processes; powerplant cooling
(c) needs of animals and humans; transportation
(d) transportation; irrigation

16) Which of the following statements about desalination is *true?*
(a) The common methods of desalination are reverse osmosis and evaporation which require little or no energy.
(b) Desalination is expensive.
(c) The removed salt can simply be dumped back into the ocean without any environmental consequences.
(d) Desalination is the best approach to solving irrigation problems.

17) Irrigation efficiency can be improved by
(a) using traditional farming techniques.
(b) using computer-controlled systems that deliver water to crops as needed.
(c) planting salt-sensitive crops.
(d) planting only genetically engineered crops.

18) Humans increase the likelihood of flooding by
(a) building on floodplains.
(b) urbanization.
(c) removing water-absorbing vegetation.
(d) all the above

19) Which of the following conditions in the Himalayan watershed contribute(s) to flooding in Bangladesh?
(a) rapid population growth
(b) deforestation
(c) unsustainable farming practices
(d) All the above

20) Floodplain management includes
(a) prohibiting building in high-risk zones.
(b) constructing floodways to minimize damage when flooding occurs.
(c) elevating buildings in flood-zones.
(d) All the above

21) For drinking water, the World Health Organization recommends a level of ______coliform bacteria colonies per 100 milliliters of water sample.
(a) 0
(b) 5
(c) 10
(d) 100

22) A body of water can be depleted of its oxygen by
(a) inorganic plant nutrients
(b) organic wastes.
(c) organic compounds such as oil, plastics, and solvents.
(d) A and B

23) All of the following strategies would help prevent cultural eutrophication except
(a) banning the use of phosphate detergents.
(b) preventing the runoff of fertilizer from agricultural fields.
(c) advance treatment of municipal sewage.
(d) stopping release of toxic heavy metal pollution.

24) Currently, the greatest problem facing the Great Lakes is
(a) point-source emission of toxins.
(b) phosphates in detergents.
(c) toxins found in runoff water as well as atmospheric deposition.
(d) oil spills from tankers using the St. Lawrence Seaway.

25) Groundwater ________.
(a) has turbulent flows that dilute pollutants.
(b) has large populations of decomposing bacteria that break down degradablewastes.

(c) is cold, which slows down decomposition rates.
(d) may take 5 to 10 years to cleanse itself of wastes.

26) In water, hydrogen and oxygen are present in the ratio of
(a) 1:8
(b) 2:12
(c) 2:3
(d) 1:2

27) An example of a triatomic molecule is
(a) Ozone
(b) Nitrogen
(c) Carbon monoxide
(d) Hydrogen

28) The quantity of matter present in an object is called its
(a) Mass
(b) Volume
(c) Density
(d) Vapour pressure

29) All samples of carbon dioxide contain carbon and oxygen in the mass ratio of 3:8. This is in agreement with the Law of
(a) Conservation of Mass
(b) Constant Proportion
(c) Multiple Proportion
(d) Reciprocal Proportion

30) _____ of stratosphere provides protection to our life.
(a) Nitrogen
(b) Hydrogen
(c) Ozone
(d) Argon

31) The life supporting gases such as O_2, CO_2 and N_2 are chiefly concentrated in the
(a) troposphere
(b) exosphere
(c) homosphere
(d) stratosphere

32) Which of the following soil is the best for plant growth?
(a) Sandy soil
(b) Clay
(c) Gravel
(d) Loamy soil

33) Both power and manure are provided by _______.
(a) thermal plants
(b) nuclear plants
(c) biogas plants
(d) hydroelectric plants

34) In the atmosphere, the layer above the troposphere is _____.
(a) stratosphere
(b) exosphere
(c) mesosphere
(d) thermosphere

35) ______ is the major raw material for biogas.
(a) Plant leaves
(b) Cow dung
(c) Mud
(d) Grass

36) Floods can be prevented by
(a) afforestation
(b) cutting the forests
(c) tilling the land
(d) removing the top soil

37) What is the difference between ecology and environmentalism?
(a) ecologists study organisms only, environmentalists study organisms and their environment
(b) environmentalism is policy advocacy, ecology is science
(c) They really are the same things
(d) One is a philosophy and the other is a thought process

38) Who Coined the term “ecology”
(a) H.C. Cowles
(b) Ernst Haeckel
(c) Charles Elton
(d) J.E.B. Warming

39) What do organisms use to maintain proper homeostasis?
(a) Negative feedback mechanisms
(b) Positive feedback mechanisms
(c) Lack of physiological controls
(d) Biomes

40) What is the point at which the soil has maximal available water after gravitational water has drained?
(a) Infiltration
(b) Wilting Point
(c) Stem flow
(d) Field capacity

41) Which would have the greatest cooling effect for a plant?
(a) Close stomata
(b) Evaporate water
(c) Melt water
(d) Use sugar at faster rate

42) Which of the following statements about underground contaminants is *false?*
(a) Degradable organic wastes do not decompose as rapidly underground as they do on the surface.

(b) There is little dissolved oxygen to aid in degradation of wastes.
(c) Waste products are diluted and dispersed quickly in underground aquifers.
(d) It can take hundreds to thousands of years for contaminated groundwater to cleanse itself of degradable wastes.

43) Groundwater would be least protected by
(a) storing hazardous liquids above ground in tanks with leak-detecting systems.
(b) putting double hulls on tankers.
(c) monitoring aquifers near landfills.
(d) requiring liability insurance for underground tanks storing hazardous liquids.

44) Continental crust is
(a) Old, light, thick, permanent
(b) Dense, heavy, not permanent
(c) Old, light, thick. Not permanent
(d) Dense, heavy, permanent

45) Plates moving alongside each other are known as
(a) Convergent boundaries
(b) Divergent boundaries
(c) Subduction zones
(d) Transform boundaries

46) Subduction zones are found at
(a) Collision zones
(b) Destructive margins
(c) Transform boundaries
(d) Divergent plate boundaries

47) An example of a constructive plate margin
(a) North American and Eurasian plate moving apart
(b) Indian and Eurasian plate colliding
(c) Nazca and South American plates moving together
(d) San Andreas fault

48) Plate movement is powered by
(a) Continental drift
(b) Plate tectonics
(c) Magma
(d) Convection currents

49) The focus of an earthquake is
(a) On the surface
(b) Origin of the quake within the crust
(c) length of time the quake lasts
(d) The number of aftershocks

50) Which of the following is Not a factor linked to the impact of an earthquake?

(a) Depth of focus
(b) Level of development
(c) Time of day
(d) Climate

51) The pollutant responsible for ozone holes is.
(a) CO_2
(b) SO_2
(c) CO
(d) CFC

52) One of the best solutions to get rid of non-biodegradable wastes is ....
(a) burning
(b) dumping
(c) burying
(d) recycling

53) Animal dung is _________________ waste
(a) biodegradable
(b) non-biodegradable
(c) hazardous
(d) toxic

54) which of the following is biodegradable?
(a) iron nails
(b) plastic mugs
(c) leather belts
(d) silver foil

55) The valve which allows the flow only one direction is a
(a) Reflux valve
(b) sluice valve
(c) gate valve
(d) bore valve

56) Distribution system in water supply in design on the basis of
(a) average daily demand
(b) peak hourly demand
(c) coincident draft
(d) greater of b and c

57) The average per capita consumption of water per day in an Indian city is about
(a) 135 L
(b) 235 L
(c) 335 L
(d) 365 L

58) Maximum permissible fluoride content in water should not exceed
(a) 150 ppm
(b) 100 ppm
(c) 50 ppm
(d) 1.5 ppm

59) Modern turbidity meters working on the principle of scattering of light are known as
(a) Spectrometer
(b) Optimeters
(c) Tintometers
(d) Nephelometers

60) Water is considered soft if there hardness does not exceed
(a) 75 ppm
(b) 100 ppm
(c) 120 ppm
(d) 150 ppm

61) Standard BOD at 20 o C is taken for the consumption
(a) 2 days
(b) 3 days
(c) 4 days
(d) 5 days

62) The most common method of waste water disposal is
(a) evaporation
(b) dilution in surface water
(c) rapid infiltration
(d) application in irrigation

63) EIA means
(a) environmental impact assessment
(b) environmental inload assessment
(c) environmental intake assessment
(d) environmental input assessment

64) Minimum dissolved oxygen required in water to save the aquatic is
(a) 1 ppm
(b) 2.ppm
(c) 5 ppm
(d) 10 ppm

65) BOD of sewage is the oxygen required to oxidized biologically
(a) active organic matter
(b) inactive organic matter
(c) both (a) and (b)
(d) organic matter

66) Activated carbon is used in water treatment for removing
(a) colour
(b) taste and odour
(c) turbidity
(d) corrosiveness

67) Diseases which may be spread by improper handling of waste water is
(a) malaria

(b) dysentery
(c) typhoid
(d) small pox

68) In Biological treatment, there is formation of a biological film of
(a) aerobic bacteria
(b) anaerobic bacteria
(c) protozoa
(d) algae

69) The presence of ozone in water is indicated by
(a) black colour
(b) blue colour
(c) light yellow colour
(d) pink colour

70) ISRO stands for
(a) Indian Space Regional Organization
(b) Indian Space Research Organization
(c) Indian Space Registered Organization
(d) None

71) Which of the following centre is used for fire monitoring?
(a) MIDOS
(b) MSIOD
(c) MODIS
(d) MADRAS

72) Raster data is represented by
(a) Line
(b) Grids
(c) Circle
(d) Point

73) Spatial interrelationship between data is known as
(a) Morphology
(b) Geology
(c) Topology
(d) All the above

74) Cartosat-1 has a spatial resolution of
(a) 1.0m
(b) 2.5m
(c) 3.5m
(d) 4.5m

75) DEM stands for
(a) Digital Elevation Model
(b) Digital Elongation Model
(c) Digital Eleven Model

(d) Digital Elector Model

76) RF stands for
(a) Representation fraction
(b) Refraction factor
(c) Rotation factor
(d) All the above

77) In conical projection, which of the following property is preserved
(a) Direction
(b) Motion
(c) Mass
(d) Equation

78) Azimuthal projection is best suited for
(a) Mountain region
(b) Terrain region
(c) Polar region
(d) All the above

79) The shape of Buffer zone around a point is a ....
(a) Circle
(b) Point
(c) Line
(d) Polygon

80) The remote sensing image is a
(a) True colour
(b) False colour composite
(c) Both a and b
(d) None

81) Along track scanning is known as
(a) Push broom
(b) Whisk broom
(c) White broom
(d) Red broom

82) Which of the following is not a type of map projection?
(a) Geographic
(b) Topography
(c) Stereograph
(d) Monograph

83) The primary source of organic matter in soil is
(a) Plant tissues such as growing and dead plants
(b) Litter such as leaves and branches that have fallen on the surface
(c) Both (a) and (b)
(d) None

84) Water tends to move down the soil by
(a) Cracks created by drying
(b) Earthworms

(c) Roots of plants
(d) All the above

85) On the basis of water retention by soil , water may be classified as
(a) Gravitational water
(b) Capillary water
(c) Hydroscopic water
(d) All the above

86) Minimum work in compressor is possible when the adiabatic index 'n' is equal to
(a) 1.1
(b) 1.25
(c) 1.4
(d) 1.0

87) Entropy change depends on
(a) Heat Transfer
(b) Temperature change
(c) Mass Transfer
(d) State

88) A heat engine is supplied with heat rate of 30,000 J/s and gives output of 9 kW.
Thermal efficiency of engine will be
(a) 30%
(b) 33%
(c) 40%
(d) 50%

89) The theoretical air fuel ratio in petrol engine is
(a) 6:1
(b) 9:1
(c) 12:1
(d)16:1

90) The spark plug gap is normally maintained at
(a) 0.2 mm
(b) 0.3 mm
(c) 0.4 mm
(d) 0.5 mm

91) Sulphur content in Diesel oil should not be more than
(a) 10%
(b) 5%
(c) 1%
(d) 0.1%

92) What is meant by thermal pollution?
(a) Warming up of an aquatic ecosystem
(b) Cooling of aquatic ecosystem
(c) Both (a) and (b)
(d) None

93) What is solid waste?
- (a) Organic material
- (b) Inorganic material
- (c) Both (a) & (b)
- (d) None

94) Solids in gas aerosol particles include,
- (a) Dust
- (b) Smoke
- (c) Fly ash
- (d) Pollen grains

95) Environmental engineering is more closely related to
- (a) public health engineering
- (b) water supply engineering
- (c) irrigation engineering
- (d) geology

96) The disease has a nature of
- (a) temporary type
- (b) permanent type
- (c) montary type
- (d) long lasting type

97) Which of the following requires treatment before disposal?
- (a) drainage
- (b) sludge
- (c) sewage
- (d) sewer

98) For removing finely suspended from solids water the process adopted is
- (a) aeration
- (b) sedimentation along with coagulation
- (c) permutit method
- (d) screening

99) Which one of the following types of sewage treatment are properly matched?
- (a) primary-biological process
- (b) secondary-mechanical process
- (c) advanced-physical and chemical processes
- (d) secondary-chemical process

100) To further sustainable use of water supplies, environmentalists are least likely to call for
- (a) reduction of pollution sources.
- (b) reuse of wastewater.
- (c) decentralization of control of water supply and quality.
- (d) moving from pollution treatment to pollution prevention.

Food Processing (Section code 11)

1) *Clostridium botulinum* is a example for

a) Thermophillic organism
b) Mesophillic organism
c) Psychrophillic organism
d) Psychotrophs

2) Low acid foods having the PH of

a) 6.5-5.8
b) 5.2-5.8
c) 4.5-5.5
d) 3.0-4.5

3) Among these which one is a bacterium?

a) Alternaria
b) Monilla
c) Cryptococcus
d) Pediococcus

4. Entrance of microorganisms into the body through the ingestion of contaminated foods is called

a) Food infection
b) Food intoxication
c) Food contamination
d) None of these

5. Which is not a Probiotic organism

a) L.fermentum
b) B.lactis
c) C.botulinam
d) none of these

6. Which is not a fermented product from milk

a) Cheesea
b) Yogurt
c) Kefir
d) Tempeh

7. Time temperature combination for HTST

a) 72^{0}C for 15sec
b) 70^{o} C for 15 sec
c) 62^{0} C for 15 sec
d) 75^{0} C for 15 sec

8. Parboiling is a well developed………….. treatment given to paddy

a) Optional
b) Premilling
c) Postmilling
d) Milling

9. Tempering refers to

a) Removal of moisture
b) Addition of moisture
c) Drying
d) Dehydration

10. Scouring also refers as

a) Polishing
b) Husking
c) Whitening

d) None

11. Paddy contains………. of proteins
   a) 10-20%
   b) 20-30%
   c) 30-40%
   d) 20-40%
12. Pneumatic separation works on the principle of……….. in aerodynamic properties
   a) Difference
   b) Equal
   c) Both
   d) None
13. Lathyrism is a disease associated with consumption of
   a) Kesari dhal
   b) Tur dhal
   c) Mung
   d) None of the above
14. The critical moisture content of agricultural produce is
   a) In between constant and falling rate periods
   b) Equivalent to initial moisture content
   c) Equivalent to final moisture content
   d) None of these
15. Food spoilage occurs due to
   a) Bacteria
   b) Molds
   c) Yeasts
   d) All of the above
16. During fruit juice canning pasteurization is done at the temperature
   a) 80^0 C
   b) 77^0 C
   c) 74^0 C
   d) 71^0 C
17. Angle of repose of wheat grain is
   a) 20^0 to 25^0
   b) 23^0 to 28^0
   c) 30^0 to 35^0
   d) 35^0 to 40^0
18. King of spices is known as
   a) Pepper
   b) Cardamom
   c) Turmeric
   d) Chilli
19. Fruits are placed in a fairly gas-tight container with potassium permanganate, which absorbs
   a) Carbondioxide gas
   b) Oxygen gas
   c) Ethylene gas
   d) Nitrogen gas
20. Which test is performed to judge the efficiency of milk pasteurization?
   a) Turbidity test
   b) Phosphatase test
   c) COB test
   d) BOD test

21. Enthalpy is defined as

a) $H= U +pV$
b) $h = u+pv$
c) $h= U +pV$
d) $H =u+pv$

22. Which one of the following is false for the unsteady –state energy balance equation?

a) The system as one input and one output stream
b) The system is well mixed with uniform temperature and composition
c) Internal energy and enthalpy are dependant of pressure
d) No phase changes occur.

23. Viscosity of ideal fluid is

a) Zero
b) One
c) Infinite
d) None

24. Energy is measured in terms of

a) Pascal
b) Newton
c) Calorie
d) No Unit

25. Over all heat – transfer coefficient for total heat – flow process through both fluids and wall is

a) $U=Q/ A(T_h-T_c)$
b) $U=1/ Q A(T_h-T_c)$
c) $U=Q/ (T_h-T_c)$
d) $U= A / Q (T_h-T_c)$

26. What should be the storage temperature for quick frozen foods?

a) -20^0 C
b) -20^0 C
c) $+0.5^0$ C
d) $+2.5^0$ C

27. Foods that contain reducing sugar undergo a color change known as

a) Millard reaction
b) Enzymic browing
c) Amadori rearrangement
d) Retrogradation

28. The most effective method to determining the quantity of organic acids in foods is------

a) Titrable acidity
b) pH
c) Biological acidity
d) Natural acidity

29. Vinegar is produced by

a) Orleans
b) Generator method
c) Submerged fermentation method
d) All of the above

30. Botulism is a disease caused by the ingestion of food containing the neurotoxin produced by

a) Clostridium botulinum

b) *Salmonella typhi*
c) *E.coli*
d) *Vibrio parahaemolyticus*

31. Which one is not the property of antibiotics?
    a) It increases aroma, flavor and appeal of foods
    b) It should not be activated by food components or products of microbial metabolism
    c) None of the above
    d) It should kill, not the inhibit the flora

32. Fatty acid completely filled with hydrogen atom are called as
    a) Saturated fatty acid
    b) Unsaturated fatty acid
    c) Poly unsaturated fatty acid
    d) Free fatty acid

33. Butter is the example of
    a) Saturated fatty acid
    b) Unsaturated fatty acid
    c) Poly unsaturated fatty acid
    d) Free fatty acid

34. Tallow is prepared from
    a) Beef
    b) Hog
    c) Pig
    d) Horse

35. Temperature at which oil ceases to flow
    a) Pour point
    b) Cold point
    c) Tubidity
    d) Flash point

36. The most abundant mineral substance in rice is
    a) Calcium
    b) Zine
    c) Potassium
    d) Iron

37. The husking/souring/milling method for rubber roll husker is
    a) shear,compression&friction
    b) shear and compression
    c) friction&abrasion
    d) impact,abrasion&friction

38. Degermination of seed is to remove
    a) Hull
    b) Tip cap
    c) Tip cap, hull and germ
    d) Germ

39. Egg yolk constitutes ………….. of the whole egg
    a) 30-32%
    b) 35-40%
    c) 45-50%
    d) 25-30%

40. Wet method of dhal milling takes……………. for processing
    a) 2-5days

b) 3-5days
c) 4-6days
d) 4-5days

41. Which of the following is not the function of carbohydrates?
a) Serve as structural component
b) Energy reserves
c) Essential component in nucleic acid
d) Influence the colour of fruit and vegetable

42. Optimum temperature range for enzyme is
a) 20^0 C
b) 30^0 C
c) 40^0 C
d) 50^0 C

43. Acetic acid is nothing but
a) Vinegar
b) Sugar solution
c) Salt solution
d) None of the above

44. Sunnet is-------------- times sweeter than sugar
a) 100
b) 200
c) 250
d) 300

45. The relationship between RH & a_w is
a) a_w =RH/100
b) a_w =RH/10
c) a_w =RH
d) None

46. Shade drying is recommended for
a) Herbs
b) Vegetables
c) Cereals
d) None

47. Fruits and vegetables respire by taking up and giving off
a) H_2O and CO_2
b) CO_2 and O_2
c) O_2 and CO_2
d) None

48. Which of the following is an example for non climacteric fruit?
a) Apple
b) Fig
c) Papaya
d) Grape

49. Conversion of glucose to pyruvate is called
a) TCA cycle
b) Respiration
c) Transpiration
d) EMP pathway

50. The ratio between CO_2 produced and O_2 consumed is termed as
a) Transpiration quotient
b) Respiration quotient

c) Respiration rate
d) Transpiration rate

51. Vantshoff equation is used to calculate

a) Q10
b) Rate of reaction in a given temperature difference
c) Respiration rate
d) Both a & b

52. The temperature of produce at which condensation occur is called

a) Dew point temperature
b) Dry bulb temperature
c) Wet bulb temperature
d) Atmosphere temperature

53. ERH for most fresh fruit and vegetable is

a) 100%
b) 97%
c) 92%
d) 80%

54. Chaff cutter, which uses………….. force to cut into bits of varying size of 10 to 40mm pieces of plant stems

a) Shear
b) Impact
c) Compressive
d) Tensile

55. Fish flesh on an average contains------------- of protein

a) 10-15%
b) 20-25%
c) 5-10%
d) 15-20%

56. --------------is the process to remove high melting glycerides from the oil

a) Degerming
b) Winterization
c) Both a&b
d) None of the above

57. For oxygen sensitive food, the best packaging method is

a) MHP
b) Vacuum
c) MAP
d) Shrink-film wrapping technique

58. Pre slaughter fasting of poultry is carried out for

a) 1day before
b) 12 hours before
c) 8 hours before
d) 2 days before

59. Removal of pin feathers is called as

a) Singeing
b) Scalding
c) Defeathering
d) Pitching

60. Egg dose not have

a) Shell

b) Air cell
c) Albumen
d) Myofibrils

61. Candling of egg is used to define the
a) Interior quality of eggs
b) Exterior quality of eggs
c) Both quality of eggs
d) None of these

62. Purpose of smoking in the meat industry is to
a) Increase the shelf life
b) Increase the flavour
c) Increase the palatability
d) All the above

63. Dimension for enthalpy is
a) L^2T^{-1}
b) LT^{-2}
c) L^2T^{-2}
d) $ML^{-1}T^{-1}$

64. The higher the operating pressure of the evaporator, --------------- the temperature of boiling
a) Lower
b) Higher
c) Same
d) None of the above

65. Steam economy is higher in
a) Single effect evaporator
b) Double effect evaporator
c) Triple effect evaporator
d) Same in a, b and c

66. Crystallization is a ---------------separation process
a) Liquid-liquid
b) Solid-liquid
c) Solid-vapor
d) Liquid-vapor

67. The fluid passing through the membrane is called
a) Retentate
b) Permeate
c) Distillate
d) None of the above

68. What is the condition required for sedimentation in liquid?
a) Particle density is higher than liquid density
b) Particle density is lower than liquid density
c) Particle density is equal to liquid density
d) None of the above

69. Plate mill is also called as
a) Roller mill
b) Hammer mill
c) Burr mill
d) Fixed head mill

70. Factors affecting emulsification are
a) Viscosity of continuous liquid phase
b) Density difference

c) Size of the droplet
d) All of the above

71. Ribbon blender is used for -------------mixing
a) Free flowing solid
b) Paste
c) Liquid
d) Cohesive solid

72. Fractional distillation is also called as
a) Distillation with reflux
b) Flash distillation
c) Equilibrium distillation
d) Simple distillation

73. In filtration μ is
a) Resistance to flow
b) Viscosity of fluid
c) Specific resistance of filter cake
d) Thickness of filter cake

74. GMP means
a) Great manufacturing practices
b) Good manufacturing practices
c) Good mechanical practices
d) Good manufacturing production

75. Control point is point in a specific food system at which
a) Loss of control may result in as unacceptable health risk
b) Loss of control does not result is an unacceptable health risk
c) A failure to meat a required critical limit
d) There is an estimate of the highly occurrence of hazard

76. Which pigment is the precursor for vitamin A?
a) Carotenoids
b) Flavanoids
c) Chlorophyll
d) Xanthophylls

77. How much headspace should be given for canned products?
a) 0.6cm
b) 1.25cm
c) 5cm
d) 0.2cm

78. Which oven is more effective in space utilization?
a) Traveling hearth oven
b) Traveling tray oven
c) Reel oven
d) Band oven

79. Exhauster in canning unit should be placed
a) Before top scaling unit
b) Before filling unit
c) After retorting
d) After cooling

80. Retro gradation is
a) Swelling of starch
b) Reassociation of starch
c) Charring of starch
d) Gelatin of starch

81. Amylase activity------------- at pH 7

a) Increases
b) Decreases
c) No change
d) Increase or decrease

82. During drying of grains, there is

a) Retro gradation and mail lard reaction
b) Maillard reaction
c) No change
d) Retro gradation only

83. In India ---------is called kalpa vriksha

a) Oil palm
b) Cashew nut
c) Coconut palm
d) Banana

84. Parhment coffee is prepared by --------------- processing method .

a) Wet
b) Bourbon
c) Dry
d) Mexican

85. What is the percentage of gluten in soft wheat flour?

a) 7-9%
b) 8-10%
c) 5-7%
d) 10-12%

86. Which of the following is not a structure builder?

a) Flour
b) Milk
c) Pulse
d) Butter

87. Shelf life of whole meal flour

a) 4weeks
b) 8weeks
c) 14days
d) 7days

88. Importance of gliadin in dough preparation

a) Increase water absorption
b) Increase fermentation activities
c) Decrease baking time
d) Gives elasticity to dough

89. Use of saccharometer is

a) To check temperature
b) To check viscosity
c) To check density of solution while boiling
d) To check the sugar content

90. Method of preserving food by preventing the entry of microorganism is termed as

a) Asepsis
b) Pasteurization
c) Blanching
d) Not termed as preservation

91. In flash pasteurization the juice is subjected to a temperature of

a) 2degree Celsius

b) 4degree Celsius
c) 5.5 degree Celsius
d) None

92. Complete removal of soluble solids from the fruit juice is called

a) Straining
b) Filtration
c) Clarification
d) None

93. To prevent clarification enzyme action the juice is heated to 77 degree Celsius for

a) 5min
b) 10min
c) 20min
d) 30min

94. Which is the most heat sensitive vitamin in food?

a) Ascorbic acid
b) Pantothenic acid
c) Thiamine
d) Riboflavin

95. Bacteria require water activity in the range of about------------ for its growth.

a) 0.8 to 1
b) 0.7 to .9
c) 0.6 to 1
d) 0.9 to 1

96. Cream separator l rotate at an average speed of

a) 5000-5500rpm
b) 4500-5000rpm
c) 5500-6000rpm
d) 5000rpm

97. The process of matting is carried out in the preparation of

a) Butter
b) Yoghurt
c) Cheese
d) Kumiss

98. The holding time of UHT should be

a) 2-3sec
b) 2-4sec
c) 3-4sec
d) 5-6 sec

99. ------------- peeling is usually used for onions and peppersa

a) Lye
b) Flame
c) Steam
d) Caustic

100. Which type of following milk contain high fat?

a) Goat
b) Buffalo
c) Cow
d) Human