PULEET - 2011

Code No.: 210111

Important: *Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.*

Roll No. *In Figure* | | | | | | | *In Words* _____

O.M.R. Answer Sheet Serial No | | | | | | |

Signature of the Candidate _____

Time: 90 minutes **Number of Questions: 75** **Maximum Marks : 75**

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO

INSTRUCTIONS

1. Write your roll No. on the Question Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Code No. of Question Booklet on the OMR answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen.**
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. To open the Question Booklet remove the seal gently when asked to do so.
5. Please check that this Question Booklet contains 75 questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of test.
6. Each question has four alternative answer (A, B, C, D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen.** There shall be negative marking for wrong answers.
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Sheet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the questions given in the Question Booklet.
9. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
10. For rough work only the blank sheet at the end of the Question Booklet be used.
11. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
12. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
13. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/ noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
14. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistance or found giving or receiving assistance or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
15. **Telecommunication equipment such as pager, cellular phone, wireless, scanner, etc., is not permitted inside the examination hall. Use of calculators is not allowed.**

2081

Multiple Choice Questions

1. If the first and $(2n-1)$th terms of an A.P., a G.P. and H.P. are equal and their nth terms are a, b, c respectively, then

   (A) $a=b=c$ (B) $a \le b \le c$ (C) $a+c=b$ (D) $ac-b^2=0$

2. The rank of the matrix $A=\begin{bmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{bmatrix}$ is 2, then the value of λ is

   (A) any row number (B) 3 (C) 1 (D) 2

3. The values of μ, for which the following system of equations:

   $(\mu-1)x+(3\mu+1)y+2\mu z=0$; $(\mu-1)x+(4\mu-2)y+(\mu+3)z=0$ and $2x+(3\mu+1)y+3(\mu-1)z=0$ is consistent and has a nontrivial solution are

   (A) 0 or 3 (B) 0 or 5 (C) 3 or 2 (D) 0 or 2

4. The value of $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ$ is equal to

   (A) $-\frac{3}{16}$ (B) $\frac{5}{16}$ (C) $\frac{3}{16}$ (D) $-\frac{5}{16}$

5. The area of the circle centred at $(1,2)$ and passing through $(4,6)$ is

   (A) 5π (B) 10π (C) 25π (D) 16π

6. If $f(x)=x^3+8x^2+15x-24$, then the value of $f\left(\frac{11}{10}\right)$ by using Taylor's series is

   (A) 3.961 (B) 3.511 (C) 5.961 (D) 4.511

7. The radius of curvature of the curve: $x^3+y^3=3axy$ at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ is

   (A) $\frac{3a}{8\sqrt{2}}$ (B) $\frac{5a}{8\sqrt{2}}$ (C) $\frac{7a}{8\sqrt{2}}$ (D) $\frac{a}{8\sqrt{2}}$

8. If $f(x,y)=0$, then $\frac{dy}{dx}$ is equal to

   (A) $\frac{f_x}{f_y}$ (B) $\frac{f_y}{f_x}$ (C) $-\frac{f_y}{f_x}$ (D) $-\frac{f_x}{f_y}$

9. If $u = x(1-y)$, $v = xy$, then $\frac{\partial(u,v)}{\partial(x,y)}$ is equal to

(A) x (B) x^2 (C) xy (D) $x - xy$

10. Under what conditions, the differential equation:

$(a\sinh x\cos y + b\cosh x\sin y)dx + (c\sinh x\cos y + d\cosh x\sin y)dy = 0$ is exact?

(A) $a = d, b = -c$ (B) $a = b, d = -c$ (C) $a = -d, b = c$ (D) $a = d, b = c$

11. The volume of the solid obtained by rotating the region bounded by the curves $y = x - x^2$ and $y = 0$ about the line $x = 2$ is

(A) $\frac{\pi}{2}$ *cubic units* (B) $\frac{\pi}{4}$ *cubic units*

(C) $\frac{\pi}{3}$ *cubic units* (D) π *cubic units*

12. The value of the double integral $\iint_R e^{x^2}\,dx\,dy$, where the region R is given by

$R: 2y \le x \le 2$ and $0 \le y \le 1$ is

(A) $\frac{1}{4}(e^4 - 1)$ (B) $\frac{1}{4}(e^4 + 1)$ (C) $\frac{1}{4}(e^4 - 4)$ (D) $\frac{1}{4}(e^4 + 4)$

13. The torsion of the curve $x = a\cos t$, $y = a\sin t$, $z = bt$ is

(A) $\frac{a}{a^2 + b^2}$ (B) $\frac{a}{a^2 - b^2}$ (C) $\frac{b}{a^2 + b^2}$ (D) $\frac{b}{a^2 - b^2}$

14. The value of the line integral $\int_C [(x^2 + xy)dx + (x^2 + y^2)dy]$ where C is the square formed by the lines $y = \pm 1$ and $x = \pm 1$ is

(A) 0 (B) 10 (C) 35 (D) $-\frac{2}{3}$

15. If $\vec{F} = ax\hat{i} + by\hat{j} + cz\hat{k}$, a, b, c are constants, then $\iint_S \vec{F}.\hat{n}\,dS$, S being the surface of a unit sphere is

(A) 0 (B) $\frac{4\pi}{3}(a+b+c)^2$ (C) $\frac{4\pi}{3}(a+b+c)$ (D) none of these

16. A block is projected along a rough horizontal road with a speed of 10m/s. The coefficient of kinetic friction is 0.10. The distance travelled by the block before coming to rest will be

(A) 10 m

(B) 50 m

(C) 5 m

(D) 15 m

17. A particle is moving in a circle of radius 10 cm with uniform speed completing the circle in 4 s. The magnitude of linear acceleration of the particle will be

(A) 2.5 cm/s^2

(B) 0.5 π cm/s^2

(C) 1.5 π cm/s^2

(D) 2.5 π^2 cm/s^2

18. A source and detector move away from eachother, each with a speed 10 m/s with respect to the ground with no wind. Given speed of sound in air = 340 m/s. If the detector detects a frequency 1950 Hz of the sound coming from the source, the original frequency of the source will be

(A) 2070 Hz

(B) 1930 Hz

(C) 2170 Hz

(D) 1800 Hz

19. A diffraction grating consisting of a large number of parallel slits all of same width 'a' and spaced equal distance 'd' between centres. For the electromagnetic wave of wavelength λ made incident normal to the surface of grating, the position of the *nth* maxima making angle θ with the grating surface is given by

(A) $2a \sin \theta = n\lambda$

(B) $d \cos \theta = n\lambda$

(C) $2d \sin \theta = n \lambda$

(D) $2d \sin \theta = n(\lambda/2)$

20. A particle executes a simple harmonic motion of time period T. The time taken by the particle to go directly from its mean position to half the amplitude is

(A) T/12

(B) T/2

(C) T/5

(D) T/20

21. The number of photons emitted per second by a 5 mW laser source emitting characteristic wavelength of 632.8 nm

(A) 6.3×10^{20}

(B) 1.6×10^{16}

(C) 1.6×10^{22}

(D) 6.6×10^{34}

22. Ultraviolet light of wavelength 280 nm and intensity 1.00 W/m^2 is directed at a lithium (work function = 2.5 eV) surface. The maximum kinetic energy of the photoelectron is

(A) 1.5 eV

(B) 1.0 eV

(C) 2.0 eV

(D) 2.5 eV

23. A nucleus has radius 5.0×10^{-15} m. The lower limit on the energy an electron ($m = 9.1 \times 10^{-31}$ kg) must have to be part of the nucleus is

(A) ~20 MeV

(B) ~ 1 GeV

(C) ~1 MeV

(D) ~10 MeV

24. In the helium-neon laser, which of the following is not true?

(A) the laser transition occurs in neon atom.

(B) the purpose of the helium atoms is to help achieve a population inversion in the neon atoms

(C) the purpose of the neon atoms is to help achieve a population inversion in the helium atoms

(D) the metastable state occur in both the Helium and Neon atoms.

25. The rms, peak and average voltage values for the household power supply (220 V a.c) in India are

(A) 220 V, $(2\sqrt{2}/\pi)$ 220 V, and $220\sqrt{2}$ V, respectively.

(B) $220/\sqrt{2}$ V, 220 V, and $(\sqrt{2}/\pi)$ 220 V, respectively

(C) 220 V, $220\sqrt{2}$ V, and $(\sqrt{2}/\pi)$ 220 V, respectively.

(D) 220 V, $220\sqrt{2}$, and $(2\sqrt{2}/\pi)$ 220 V, respectively.

26. Three capacitors of capacitances 2μF, 3 μF and 6 μF are connected in series with a 12 V battery. All the connecting wires are disconnected, the three positive plates are connected together and three negative plates are connected together. The charges on the capacitors after reconnections will be

(A) 108/11 μC, 108/11 μC and 108/11 μC, respectively.

(B) 24 μC, 36 μC and 72 μC, respectively.

(C) 2 μC, 3 μC and 6 μC, respectively.

(D) 72/11 μC, 108/11 μC and 216/11 μC, respectively.

27. The daughter nucleus after beta (β^-) decay of the ${}^{210}_{83}Bi$ isotope undergoes alpha decay, the final product will be

(A) ${}^{205}_{82}Pb$

(B) ${}^{206}_{82}Pb$

(C) ${}^{206}_{83}Bi$

(D) ${}^{206}_{81}Tl$

28. White light is passed through a double slit and interference pattern is observed on a screen 2.5 m away. The separation between the slits is 0.5 mm. The first violet and red fringes are formed at 2.0 mm and 3.5 mm away from the central white fringe. The wavelengths of the violet and the red light are

(A) 400 nm and 700 nm, respectively.

(B) 450 nm and 750 nm, , respectively.

(C) 350 nm and 650 nm, , respectively.

(D) 700 nm and 400 nm, respectively.

29. The correct order of electromagnetic spectrum with decreasing wavelength is

(A) X-rays, Ultraviolet rays, Infrared rays, Microwaves, Radiowaves

(B) Radiowaves, Infrared rays, Microwaves, Ultraviolet rays, X-rays

(C) Radiowaves, Infrared rays, Ultraviolet rays, Microwaves, X-rays

(D) Radiowaves, Microwaves, Infrared rays, Ultraviolet rays, X-rays

30. Number of atoms in a face centred cubic cell is

(A) 8

(B) 2

(C) 3

(D) 4

31 If the applied voltage of a certain transformer is increased hr 50% and the frequency is reduced to 50% (assuming that the magnetic circuit remains unsaturated), the maximum core flax density will

(A) change to three times the original value.
(B) change to 1.5 times the original value.
(C) change to 0.5 times as the original value.
(D) remain the same as the original value.

32 Constant voltage source is

(A) active and bilateral.
(B) active and unilateral.
(C) passive and bilateral.
(D) passive and unilateral.

33 the diagram for alternating quantities can be drawn if the have ------- wave.

(A) rectangular.
(B) sinusoidal.
(C) triangular
(D) any of these.

34 in an ac circuit the apllied voltage and current drawn are represented as $v=V_{max}\sin\omega t$ and $i=I_{max}\sin(\omega t+\varphi)$, then the power factor of the circuit is

(A) $\sin\varphi$
(B) $\cos\varphi$(lagging)
(C) $\cos\varphi$(leading)
(D) none of these.

35 in series DC motor, the field flux is

(A) praclecally constant
(B) inversely proportional to armature current
(C) directely proportional to armature current
(D) directely proportional to square root of armature current.

36 when an induction motor runs at rated load and speed, the iron losses are:

(A) negligible
(B) very heavy
(C) independent of supply frequency
(D) independent of supply voltage.

37 Single phase induction motor can be made self starting by

(A) adding series combination of a capacitor and auxiliary winding in parallel with the main winding.
(B) adding an auxiliary winding in parallel with the main winding.
(C) adding an auxiliary winding in series with a capacitor and the main winding.
(D) none of these.

38 Material subjected to rapid reversals of magnetism should have

(A) high permeability and low hysteresis loss.
(B) Large B-H loop area.
(C) Large coercivity and high retentivity.
(D) Low permeability and large coercivity.

39 an ac circuit is given by $i = 10+10\sin 314t$. The average and r.m.s. values of current are

(A) 16.36A,17.07A
(B) 10A, 17.07A
(C) 10A,12.25A
(D) 16.36A,12.2A

40 three phase power in electrical system is calculate by the expression.

(A) $VI\cos\varphi$
(B) $\sqrt{3}V_{Ph}I_{Ph}\sin\varphi$
(C) $\sqrt{3}V_LI_L\cos\varphi$
(D) $3V_LI_L\cos\varphi$

41. Which type of special-purpose diode is formed by a junction between a layer of metal and a layer of semiconductor?

A) A tunnel diode
B) A zener diode
C) A varactor diode
D) A Schottky diode

42. Physical logic gates take a finite time to respond to changes in their input signals. What name is given to this time?

A) Set-up time.
B) Propagation delay time.
C) Rise time
D) Hold time.

43. In a bipolar transistor biased in the forward active region the base current is I_B =50 μA and the collector current is I_C =2.7 mA. The α is

A) 0.949
B) 54
C) 0.982
D) 0.018

44. A device that converts thermal energy into electrical energy is called a :

A) thermocouple
B) solar cell
C) piezoelectric device
D) generator

45. What is the most widely used method for the automated simplification of Boolean expressions?

A) Karnaugh maps.
B) Quine-McCluskey minimisation.
C) Fast Fourier transforms.
D) Binary reduction.

46. The conditions for oscillation to occur are described by which of the following?

A) Nyquist's theorem.
B) Sampling theorem.
C) Faraday's law.
D) The Barkhausen criterion.

47. What term describes the maximum expected error associated with a measurement or a sensor?

A) Range.
B) Resolution.
C) Accuracy.
D) Precision.

48. What is meant by a single-chip data acquisition system?

A) A single integrated circuit containing an ADC and a multiplexer.
B) A single integrated circuit containing a DAC and a demultiplexer.
C) A single integrated circuit containing an ADC and a DAC
D) A single integrated circuit containing all the elements of a data acquisition system.

49. In 50 % modulated AM signal, the carrier is suppressed before transmission. The saving in transmitted power would be:

A) 72 %
B) 11.1%
C) 88.9 %
D) 18 %

50.An FM signal with a deviation ratio δ is passed through a mixer and has its frequency reduced sixfold. The deviation in the output of the mixer is:

A) 6 δ
B) δ/6
C) insufficient information
D) δ

51 In C, the escape sequence begins with character
A) %
B) /
C) \
D) #

52 Consider the following code:
```
switch (ch)
{
    case 'a': printf("a");
    case 'b': printf("b");
    default: printf("error");
}
```
If value 'a' is given to character variable ch, then the output will be
A) a
B) ab
C) error
D) aberror

53 Which of the following is not a valid reason for using functions
A) They use less memory than repeating the same code
B) They run faster
C) They keep different program activities separate
D) They keep variables safe from other parts of the program

54 Which of the following operation is not permitted on pointers
A) Division of a pointer variable by a number
B) Adding a number to a pointer variable
C) Difference of two pointer variables
D) Incrementing a pointer variable

55 A structure is
A) scalar data type
B) derived data type
C) primitive data type
D) none of the above

56 The operator used to access the structure member is
A) .
B) *
C) []
D) &

57 The function fopen() when fails to open a file, then it returns value
A) NULL
B) -1
C) +1
D) void

58 Consider the following code segment
```
FILE *fp;
fp=fopen("notes.txt","r+");
```
Which of the following operations can be performed on notes.txt file
A) reading
B) writing
C) appending
D) all of the above

59 The unit that performs the arithmetic and logical operations on the stored numbers is known as
A) Control unit
B) ALU
C) Memory Unit
D) I/O Unit

60 Choose the wrong statement
A) C++ allows any operator to be overloaded
B) Some of the existing operators cannot be overloaded
C) Operator precedence cannot be changed
D) C++ can be used for the development of procedure oriented as well as object oriented programs.

61 Steady flow energy equation is applicable to
A) Compressor
B) Turbine
C) Heat exchanger
D) All of the above

62 Steam table can be used for
A) Producing steam
B) Collecting steam
C) Calculating the volume of steam
D) Calculating dryness fraction

63 Which of the following is a steam power cycle
A) Otto cycle
B) Diesel cycle
C) Rankine cycle
D) Dual cycle

64 A flow net is drawn using
A) Stream lines
B) Equi-potential lines
C) Both (a) and (b)
D) Flow lines

65 Bernoulli's equation is applicable to
A) Venturimeter
B) Pitot tube
C) Orificemeter
D) All of the above

66 Rotameter is used for measuring
A) Rotational speed
B) Flow rate
C) Density of liquid
D) Piezometric head

67 A gear is mounted on a shaft with a key arrangement. Factor of safety (FOS) of key should be
A) Smaller than FOS of gear
B) Smaller than FOS of shaft
C) Both (a) and (b)
D) Larger than FOS of shaft and gear

68 Point of contraflexture is a point where
A) Bending moment is zero
B) Shear force is zero
C) Shear force is maximum
D) Bending moment is maximum

69 Beams are designed mainly for taking up
A) Direct tensile stresses
B) Direct compressive stresses
C) Bending stresses
D) Torsional shear stresses

70 In the bending formula, $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$; symbol 'M' represents
A) Mass
B) Bending moment
C) Mean Force
D) Mean load

Q.No. 71 The water of a river has an important property called

(A) Turbidity
(B) Self Purification
(C) Permeability
(D) Infiltration Capacity

Q No. 72 Human ear is sensitive to sound waves in the frequency range of

(A) 20 Hertz to 20000 Hertz
(B) 30 Hertz to 30000 Hertz
(C) 40 Hertz to 40000 Hertz
(D) All the above

Q No. 73 Aeration is done for removal of

(A) Colour (B) Turbidity
(C) Hardness (D) Bad Odour

Q No. 74 In an ecosystem tertiary consumers are

(A) Animals feeding on trees
(B) Carnivores like snakes, birds etc
(C) Carnivores like lion, tiger etc
(D) Microorganisms like fungi

Q No. 75 To measure quality of ambient air, instrument used is known as

(A) Barometer
(B) High Volume Sampler
(C) Atomic Absorption Spectrophotometer
(D) Gas Chromatograph

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