

POST GRADUATE COMMON ENTRANCE TEST - 2015

DATE & TIME	COURSE	SUBJECT
08-08-2015 10.30 AM TO 12.30 PM	ME / M.Tech/ M.Arch / Courses Offered by VTU / UVCE / UBDTCE	ELECTRICAL SCIENCE E & E / E & C / TC / IT / BME / ME
MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
100	150 MINUTES	120 MINUTES
MENTION YOUR PGCET NO.		QUESTION BOOKLET SERIAL NUMBER
		344241
		VERSION CODE
		A - 1

DOs :

1. Check whether the PGCET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. Ensure whether the circles corresponding to course and the specific branch have been shaded on the OMR answer sheet.
3. This question booklet is issued to you by the invigilator after the **2nd bell i.e., after 10.25 am.**
4. The serial number of this question booklet should be entered on the OMR answer sheet.
5. The version code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
6. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts:

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. **THE 3RD BELL RINGS AT 10.30 AM, TILL THEN;**
 - Do not remove the seal / staple present on the right hand side of this question booklet.
 - Do not look inside this question booklet.
 - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 75 (items) questions and each question will have one statement and four answers. (Four different options / responses.)
2. After the 3rd Bell is rung at 10.30 am, remove the seal / staple stapled on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 120 minutes:
 - Read each question (item) carefully.
 - Choose one correct answer from out of the four available responses (options / choices) given under each question / item. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **only one response** for each item.
 - Completely **darken / shade the relevant circle with a blue or black ink ballpoint pen against the question number on the OMR answer sheet.**
4. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
5. After the **last bell is rung at 12.30 pm**, stop marking on the OMR answer sheet and affix your left hand thumb impression on the OMR answer sheet as per the instructions.
6. Hand over the **OMR answer sheet** to the room invigilator as it is.
7. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (candidate's copy) to you to carry home for self evaluation.
8. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.
9. Only **Non-programmable** calculators are allowed.

MARKS DISTRIBUTION

PART - A : (SECTION - 1) 30 QUESTIONS : 30 X 1 = 30; (SECTION - 2) 15 QUESTIONS : 15 X 2 = 30
 PART - B : (SECTION - 1) 20 QUESTIONS : 20 X 1 = 20; (SECTION - 2) 10 QUESTIONS : 10 X 2 = 20

SEAL

ELECTRICAL SCIENCE

IMPORTANT INSTRUCTIONS & BRANCHWISE INDEX

Question Nos. 1 to 45 compulsory and common to all the branches. Question Nos. 46 to 75 are optional. sub-branches are there in this booklet. The candidate has to opt for any one branch according to his / her Application Form.

Sub - Branch	Subject	Subject	
		From	To
1.	Electrical and Electronics Engineering (E & E)	8	10
2.	Electronics and Communication Engineering (E & C)	11	15
3.	Bio-Medical Engineering (BME) & Medical Electronics (ME)	16	19
4.	Instrumentation Technology (IT)	20	23

1. In the system of equations $\begin{bmatrix} 1 & -a \\ -a & 1 \end{bmatrix} x = \begin{bmatrix} b \\ c \end{bmatrix}$ where a is a real constant, for what value of a the Jacobi and Gauss - Seidal methods converge
- a. $|a| > 1$ b. $|a| < 1$
c. $a = 2$ d. Any value of a
2. The Eigen values of a matrix $A = \begin{bmatrix} 0.5 & 0 & 0 \\ 0 & -4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ are
- a. 1, -4, 1 b. 0.5, -4, 1
c. 0, 0.5, -4 d. -1, 4, -0.5
3. $\lim_{x \rightarrow \infty} \left(\frac{x}{x+1} \right)^x$ is equal to
- a. 2 b. e
c. 1 d. None of these
4. Green's theorem in the plane is applicable to
- a. xy - plane b. yz - plane
c. zx - plane d. All of these
5. Differential amplifiers are used in
- a. Instrumentation amplifiers
b. Voltage followers
c. Voltage regulators
d. Buffers
6. Access time is faster for
- a. ROM b. SRAM
c. DRAM d. None of these
7. 8253 IC is used in 8085 based system to
- a. Enable peripherals.
b. Enable keyboard.
c. Enable timer.
d. Enable Interrupts.
8. SDRAM refers to
- a. Static DRAM
b. Synchronous DRAM
c. Sequential DRAM
d. Semi DRAM
9. Removing bypass capacitor across the emitter-leg resistor in a CE amplifier causes
- a. Increase in current gain.
b. Decrease in current gain.
c. Increase in voltage gain.
d. Decrease in voltage gain.
10. In a JFET, at pinch-off voltage applied on the gate
- a. The drain current becomes almost zero
b. The drain current begins to decrease
c. The drain current is almost at saturation value.
d. The drain-to-source voltage is close to zero volts.

Space For Rough Work

11. In class-A amplifier, the output current flows for
- a part of the cycle of the input signal.
 - the full cycle of the input signal.
 - half the cycle of the input signal.
 - 3/4th of the cycle of the input signal.
12. The power conversion efficiency of an output stage is defined as_____.
- $(\text{Load power} + \text{supply power}) / \text{supply power}$
 - $(\text{Load power} + \text{supply power}) / (\text{load power} + \text{supply power})$
 - $\text{Load power} / \text{supply power}$
 - $\text{Supply power} / \text{load power}$
13. Transistor is a
- Current controlled current device.
 - Current controlled voltage device.
 - Voltage controlled current device.
 - Voltage controlled voltage device.
14. The type of power amplifier which exhibits crossover distortion in its output is
- Class A
 - Class B
 - Class AB
 - Class C
15. An oscillator of the LC type that has a split capacitor in the circuit is
- Hartley oscillator
 - Colpitts oscillator
 - Weinbridge oscillator
 - R-C phase shift oscillator
16. Rectification efficiency of a full wave rectifier without filter is nearly equal to
- 51%
 - 61%
 - 71%
 - 81%
17. The 'slew rate' of an operational amplifier indicates
- how fast its output current can change
 - how fast its output impedance can change
 - how fast its output power can change
 - how fast its output voltage can change when a step input signal is given.
18. A zener diode
- Has a high forward voltage rating.
 - Has a sharp breakdown at low reverse voltage.
 - Is useful as an amplifier.
 - Has a negative resistance.
19. Which of the following Boolean rules is correct?
- $A + 0 = 0$
 - $A + 1 = 1$
 - $A + A = A.A$
 - $A + AB = A + B$
20. Peak overshoot of step-input response of an under damped second-order system is explicitly indicative of
- Settling time.
 - Rise time.
 - Natural frequency.
 - Damping ratio.

Space For Rough Work

21. Electrical time-constant of an armature-controlled dc servomotor is
- Equal to mechanical time-constant.
 - Smaller than mechanical time-constant.
 - Larger than mechanical time-constant.
 - Not related to mechanical time-constant.
22. Active loaded MOS differential circuit has a
- high CMRR.
 - low CMRR.
 - high delay.
 - high differential gain.
23. For a 3-bit flash ADC, the number of comparators required are
- 5
 - 9
 - 7
 - 3
24. Given a MOD-14 ripple counter using J-K flip-flops. If the clock frequency to the counter is 30 KHz, then the output frequency of the counter will be
- 2.2 KHz.
 - 30 KHz.
 - 2.14 KHz.
 - 3.2 KHz.
25. The Maximum binary number counted by a ripple counter that uses four FlipFlop's is
- $(0000)_2$
 - $(1011)_2$
 - $(1111)_2$
 - $(0101)_2$
26. In an SCR the holding current is
- more than latching current
 - less than latching current
 - equal to latching current
 - very small
27. A cut set has
- Only one tree branch
 - Always more than one tree branch
 - Only one tree link
 - None of these
28. Gauss law relates the electric field intensity E with volume charge density ρ at a point as:
- $\nabla \times E = \epsilon_0 \rho$
 - $\nabla \cdot E = \rho / \epsilon_0$
 - $\nabla \times E = \rho / \epsilon_0$
 - $\nabla \cdot E = \epsilon_0 \rho$
29. The electric field strength at any point equals:
- The potential gradient at that point
 - Negative of the potential gradient at that point
 - The charge at that point
 - Negative of the charge at that point
30. For a two-port network to be reciprocal,
- $Z_{11} = Z_{22}$
 - $Y_{21} = Y_{12}$
 - $h_{21} = h_{12}$
 - $AD-BC=0$

Space For Rough Work

PART - A (SECTION - II)
(Each question carries two marks)

(15 X 2 = 30)

31. $L^{-1}\left[\frac{1}{(s^2 + 4s + 13)}\right] =$

a. $\frac{1}{2}e^{-1t}\sin 3t$

b. $\frac{1}{3}e^{-2t}\sin 3t$

c. $\frac{1}{4}e^{-2t}\sin 3t$

d. $\frac{1}{2}e^{-3t}\sin 3t$

32. The equation $a_0x^2y'' + a_1xy' + a_2y = f(x)$ is called

- a. Legendre's linear equation
- b. Cauchy's linear equation
- c. Simultaneous equation
- d. Method of undetermined co-efficient

33. If $P(A)=0.35, P(B)=0.73$ and $P(A \cap B) = 0.14$ then $P(A \cup B) =$

- a. 0.84
- b. 0.73
- c. 0.93
- d. 0.94

34. The decimal equivalent of hex number 1A53 is

- a. 6793
- b. 6739
- c. 6973
- d. 6379

35. The simplification of the Boolean expression $(\overline{ABC}) + (\overline{ABC})$ is

- a. 0
- b. 1
- c. A
- d. BC

36. If the input to T-flip flop is 100 Hz signal, the final output of the three T-flip flops in cascade is

- a. 1000 Hz
- b. 500 Hz
- c. 333 Hz
- d. 12.5 Hz.

37. For the circuit shown in Fig.1, the input resistance R_{in} will be

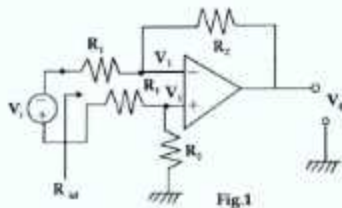


Fig.1

- a. $2R_1$
- b. $2R_1 + R_2$
- c. $2(R_1 + R_2)$
- d. Infinity.

Space For Rough Work

38. If for a control system, the Laplace transform of error $e(t)$ is given $\frac{8(s+3)}{s(s+10)}$ as then the steady state value of the error works out as _____
- a. 3.6 b. 1.8
c. 3.2 d. 2.4
39. In an n-type semiconductor, as temperature T increases, the Fermi level E_F
- a. moves towards conduction band
b. moves towards middle of forbidden energy gap
c. does not vary
d. may or may not shift depending upon the concentration of donor atoms
40. In integrated circuits, npn construction is preferred to pnp construction because
- a. npn construction is cheaper
b. to reduce diffusion constant, n-type collector is preferred
c. npn construction permits higher packing of elements
d. p-type base is preferred
41. In SCR, the turn ON time
- a. is independent of V_g
b. decreases with increase of V_g
c. varies as V_g
d. varies as V_{g2}
42. A resistor used in color TV has the following color bands: yellow, violet, orange and silver. Its nominal value is
- a. 4.7 KW \pm 10 %
b. 4.7 KW \pm 5 %
c. 47 KW \pm 10 %
d. 470 KW \pm 5 %
43. The NAND gate output will be low if the two inputs are
- a. 00 b. 01
c. 10 d. 11
44. What is the binary equivalent of the decimal number 368
- a. 101110000 b. 110110000
c. 111010000 d. 111100000
45. EPROM contents can be erased by exposing it to
- a. Ultraviolet rays.
b. Infrared rays.
c. Burst of microwaves.
d. Intense heat radiations.

Space For Rough Work

Note: Please choose to answer part - B below corresponding to your basic degree

(E & E: ELECTRICAL AND ELECTRONICS ENGINEERING)

PART - B (SECTION - I)

(Each question carries one mark)

(20 X 1 = 20)

- | | |
|---|---|
| 46. Which of the following is usually not the generating voltage ?
a. 6.6 kV b. 9.9 kV
c. 11kV d. 13.2 kV. | 51. Most of the generators in thermal power plants run at
a. 3000 rpm b. 1500 rpm
c. 1000 rpm d. 750 rpm |
| 47. Which of the following is not the distribution system normally used
a. 3 phase - 4 wire
b. 3 phase - 3 wire
c. Single phase - 3 wire
d. Single phase - 4 wire. | 52. The overall efficiency of a boiler in a thermal power plant is of the order of
a. 10% b. 25 to 30%
c. 40 to 50% d. 70 to 80%. |
| 48. Transmission efficiency increases as
a. Voltage and power factor both increase
b. Voltage and power factor both decrease
c. Voltage increases but power factor decreases
d. Voltage decreases but power factor increases. | 53. Stampings in transformers are provided to reduce
a. Hysteresis loss
b. Eddy current loss
c. Copper loss
d. All of the above. |
| 49. Coal used in power plant is also known as
a. steam coal b. charcoal
c. coke d. soft coal. | 54. The regulation of a transformer is least affected by changes in frequency at
a. leading power factor
b. lagging power factor
c. unity power factor
d. all of the above. |
| 50. Which of the following enters the super heater of a boiler ?
a. Cold water
b. Hot water
c. Wet steam
d. Super-heated steam | 55. Which of the following motor has the poorest speed regulation ?
a. Shunt motor
b. Series motor
c. Differential compound motor
d. Cumulative compound motor |

Space For Rough Work

56. At the instant of starting when a D.C. motor is put on supply, it behaves like
- a highly resistive circuit
 - a low resistance circuit
 - a capacitive circuit
 - none of the above
57. Regenerative method of braking is based on that
- back e.m.f. is less than the applied voltage
 - back e.m.f. is equal to the applied voltage
 - back e.m.f. of rotor is more than the applied voltage
 - none of the above
58. In a circulating-current type of dual converter, the nature of the voltage across the reactor is:
- Alternating
 - Pulsating
 - Direct
 - Triangular
59. An IGBT has three terminals called:
- Collector, Emitter and Base
 - Drain, Source and Base
 - Drain, Source and Gate
 - Collector, Emitter and Gate
60. A four quadrant operation require:
- Two full converters in series
 - Two full converters connected back to back
 - Two full converters connected in parallel
 - Two semi conductors connected back to back
61. The stability of the power system is not affected by:
- Generator reactance
 - Line reactance
 - Excitation of the generator
 - Line losses
62. Equal area criteria gives the information regarding
- Stability region
 - Absolute Stability
 - Relative Stability
 - Swing Curves
63. Gauss-Seidel iterative method can be used for solving a set of
- linear differential equations only
 - linear algebraic equation only
 - both linear and nonlinear algebraic equations
 - both linear and nonlinear differential equations
64. Corona loss can be reduced by the use of hollow conductors because
- the current density is reduced
 - the eddy current in the conductor is eliminated
 - for a given cross-section, the radius of the conductor is increased
 - of better ventilation in the conductor
65. Whenever the conductors are dead-ended , there is a change in the direction of transmission line, the insulator. used are of the
- Pin type
 - Suspension type
 - Strain type
 - Shackle type

Space For Rough Work

PART - B (SECTION - II)

(Each question carries two mark)

(10 X 2 = 20)

66. An alternator has rated field current of 4 A. The alternator develops 180 V while drawing a field current of 2 A at 750 rpm. If the field current is made 4 A at 750 rpm generated voltage could be
- a. 330 V b. 380 V
c. 60V d. 400 V.
67. A 10k VA, 400 V/200 V single phase transformer with 10 % impedance draws a steady short circuit line current of
- a. 50 A b. 150 A
c. 250 A d. 350 A
68. The direction of rotation of a D.C. series motor can be changed by
- a. Interchanging supply terminals
b. Interchanging field terminals
c. Either of a. and b. above
d. None of the above
69. If the field of a D.C. 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
70. A single phase transmission line of impedance $j 0.8 \text{ ohm}$ supplies a resistive load of 500 A at 300 V. The sending end power factor is
- a. unity b. 0.8 lagging
c. 0.8 leading d. 0.6 lagging
71. The frequency of the ripple in the output voltage of 3-phase semiconductor depends on:
- a. Firing angle and load resistance
b. Firing angle and load inductance
c. The load circuit parameters
d. Firing angle and the supply frequency
72. A thyristor can be termed as:
- a. DC switch
b. AC switch
c. Both AC and DC switch
d. None of the above
73. The transient stability limit of the power system can be increased by introducing:
- a. Series Inductance
b. Shunt Inductance
c. Series Capacitance
d. Shunt Capacitance
74. For stability and economic reason we operate the transmission line with power angle in the range of:
- a. 10° to 25° b. 30° to 45°
c. 60° to 75° d. 65° to 80°
75. The transfer of power between two stations is maximum when the phase angle displacement between the voltages of the two stations is
- a. Zero b. 90°
c. 120° d. 180°

Space For Rough Work

(E & C AND TC: ELECTRONICS & COMMUNICATION ENGINEERING & TELECOMMUNICATION ENGINEERING)

PART - B (SECTION - I)

(Each question carries one mark)

(20 X 1 = 20)

46. The no. of address lines required to address a memory of size 32 K is
- a. 15 lines b. 16 lines
c. 18 lines d. 14 lines
47. Which of the following statements is false?
- a. RTOS performs tasks in predictable amount of time
b. Windows 98 is RTOS
c. Interrupts are used to develop RTOS
d. Kernel is the one of component of any OS
48. Which of the following statement is true?
- a. The group of machine cycle is called a state.
b. A machine cycle consists of one or more instruction cycle.
c. An instruction cycle is made up of machine cycles and a machine cycle is made up of number of states.
d. None of the above
49. The impulse response of a continuous time system is given by $h(t) = d(t-1) + d(t-3)$. The value of the step response at $t = 2$ is
- a. 0 b. 1
c. 2 d. 3
50. Two systems with impulse responses $h_1(t)$ and $h_2(t)$ are connected in cascade. Then the overall impulse response of the cascaded system is given by
- a. Product of $h_1(t)$ and $h_2(t)$
b. Sum of $h_1(t)$ and $h_2(t)$
c. Convolution of $h_1(t)$ and $h_2(t)$
d. Subtraction of $h_2(t)$ from $h_1(t)$
51. Negative feedback in an amplifier
- a. Reduces gain
b. Increase frequency & phase distortion
c. Reduces bandwidth
d. Increases noise
52. The ideal OP-AMP has the following characteristics.
- a. $R_i = \infty, A = \infty, R_o = 0$
b. $R_i = 0, A = \infty, R_o = 0$
c. $R_i = \infty, A = \infty, R_o = \infty$
d. $R_i = 0, A = \infty, R_o = \infty$

Space For Rough Work

53. CMOS logic has the property of
- Increased capacitance and delay
 - Decreased area
 - High noise margin
 - Low static power dissipation
54. In a travelling electromagnetic wave, E and H vector fields are
- Perpendicular in space
 - Parallel in space
 - E is in the direction of wave travel
 - H is in the direction of wave travel
55. For a transmission line terminated in its characteristic impedance, which of the following statements is incorrect:?
- It is a smooth line
 - The energy distribution between magnetic and electric field is not equal
 - Standing wave does not exist.
 - Efficiency of transmission of power is maximum
56. The dominant mode of rectangular wave guide is
- TE_{11}
 - TM_{11}
 - TE_{01}
 - TE_{10}
57. Reciprocal of reluctance is
- Henry/meter
 - Henry
 - meter/Henry
 - 1 Henry^{-1}
58. Introducing a resistor in the emitter of a common amplifier stabilizes the dc operating point against variations in
- Only the temperature
 - Only the β of the transistor
 - Both Temperature & β
 - None of the above
59. The bandwidth of an RF tuned amplifier is dependent on
- Q-factor of the tuned o/p circuit
 - Q-factor of the tuned i/p circuit
 - Quiescent operating point
 - Q-factor of the o/p and i/p circuits as well as quiescent operating point

Space For Rough Work

60. Inverter gain is given by the ratio

a. $\frac{dc\ output\ voltage}{ac\ input\ voltage}$

b. $\frac{ac\ output\ voltage}{ac\ input\ voltage}$

c. $\frac{dc\ output\ voltage}{dc\ input\ voltage}$

d. $\frac{ac\ output\ voltage}{ac\ input\ voltage}$

61. When SCR starts conducting thenlosses all control

- a. gate
- b. cathode
- c. anode
- d. none of the above

62. Which type of power supply is usually preferred for PC

- a. Switched mode power supply
- b. Resonant power supply
- c. Bidirectional power supply
- d. None of the above

63. The major applications of chopper drive is in

- a. Traction
- b. Computer
- c. Heating furnances
- d. Miniature motors

64. In a dual converter, the circulating current

- a. allows smooth reversal of load current, but increases the response time
- b. does not allows smooth reversal of load current, but reduces the response time
- c. allows smooth reversal of load current with improved speed of response
- d. flows only if there is no interconnecting inductor

65. In a DMA write operation the data is transferred

- a. from I/O to memory.
- b. from memory to I/O.
- c. from memory to memory.
- d. from I/O to I/O.

Space For Rough Work

(SECTION - II)

(Each question carries two marks)

(10 X 2 = 20)

66. The logic function $f = \overline{xy + xy}$ is the same as
- $f = (x+y)(\overline{x+y})$
 - $f = \overline{(x+y)}(x+y)$
 - $f = (\overline{xy})(\overline{xy})$
 - None of the above
67. Unit step response of the system described by the equation $y(n) + y(n-1) = x(n)$ is
- $\frac{z^2}{(z+1)(z-1)}$
 - $\frac{z}{(z+1)(z-1)}$
 - $\frac{z+1}{(z-1)}$
 - $\frac{z(z-1)}{(z+1)}$
68. Encoder
- Assigns quantized values
 - Changes quantized values
 - Changes quantized values to numerical values
 - Changes numerical values to binary values
69. In the following 8085 program how many times(decimal) is the DEC C executed?
- ```
Loop: MVI C, 78H
 DCR C
 JNZ loop
 HLT
```
- 119
  - 120
  - 78
  - 77
70. Laplace transform of  $\sin(\omega t + \alpha)$  is
- $\frac{s \cos \alpha + \omega \sin \alpha}{s^2 + \omega^2}$
  - $\frac{\omega}{s^2 + \omega^2} \cos \alpha$
  - $\frac{s}{s^2 + \omega^2} \sin \alpha$
  - $\frac{s \sin \alpha + \omega \cos \alpha}{s^2 + \omega^2}$

Space For Rough Work

71. Program counter is used to
- Store address of the next instruction to be executed
  - Store temporary data to be used in arithmetic operation
  - Store the status of the microprocessor
  - None of the above

72. Consider the following statements
- Race around flip flop occur in a JK flip-flop where both the inputs are one.
  - A flip flop is used to store one bit of information
  - A transparent latch consist in D flip-flop
  - Master slave configuration is used in flip-flop to store in two bits of information.

Which of these statements are correct?

- i, ii and iii
- i, iii and iv
- i, ii and iv
- ii, iii and iv

73. In QAM, both \_\_\_ of a carrier frequency are varied.

- Frequency and amplitude
- Phase and frequency
- Amplitude and phase
- None of the above

74. A communication channel with additive white Gaussian noise has a bandwidth of 4KHz and a SNR of 1.5. If channel capacity is

- 1.6 kbps
- 16 kbps
- 32 kbps
- 256 kbps

75. The decimal equivalent of the hexadecimal number  $3E8_{16}$  is

- |         |        |
|---------|--------|
| a. 1000 | b. 982 |
| c. 768  | d. 323 |

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Space For Rough Work

**(BME & ME: BIOMEDICAL ENGINEERING & MEDICAL ELECTRONICS)**

**PART - B (SECTION - I)**

(Each question carries one mark)

**(20 X 1 = 20)**

46. What is the purpose of defibrillation?
- Removing fibrous matter from vegetables
  - Removing bodily hair
  - Restoring the rhythm of the heart
  - Reducing a fever from medication
47. The type of pacemaker that generates electrical impulses when the patients heart rate falls below a predetermined rate is called
- A demand pacemaker
  - Asynchronous pacemaker
  - Repolarization pacemaker
  - A non demand pacemaker
48. Which of the following flow measurement techniques is not based on the principle of indicator dilution?
- Plethysmography
  - Injecting saline
  - Injecting indocyanine green
  - Fick technique
49. The audiogram showing a conductive type of hearing loss will indicate
- Impaired bone conduction, impaired air conduction
  - Normal bone conduction, normal air conduction
  - Impaired air conduction, normal bone conduction
  - Normal bone conduction and an air bone gap
50. X-rays were discovered by W K Roentgen in the year
- |         |         |
|---------|---------|
| a. 1885 | b. 1985 |
| c. 1895 | d. 1958 |
51. The photo cathode is coated with a material which normally is
- Photo reflective
  - Photo emissive
  - Photo refractive
  - Photo deflective

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**Space For Rough Work**

52. The velocity of the reflected ultrasound wave, when compared to the incident ultrasound wave is
- Zero
  - less
  - more
  - same
53. The brightness of an MR image depends on
- proton density
  - T1
  - T2
  - All of these
54. Sinusoidal signal  $x(t) = 4 \cos\left(200t + \frac{\pi}{6}\right)$  is passed through a square law device defined by the input output relation  $y(t) = x^2(t)$ . The DC component in the signal is
- 3.46
  - 4
  - 2.83
  - 8
55. Energy of the signal  $A \delta[n]$  is
- $A^2$
  - $A^2/2$
  - $A^2/4$
  - 0
56. Fourier series of an odd periodic function contains only
- Odd harmonics
  - Even harmonics
  - Cosine terms
  - Sine terms
57. FIR filters are
- Non recursive type
  - Recursive type
  - Neither recursive nor non recursive
  - None of these
58. Turning point algorithm is one of \_\_\_\_\_ algorithm
- Lossless
  - Lossy
  - Neither lossless nor lossy
  - None of these

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59. A real time QRS detection algorithm developed by
- Hamilton and Tompkins
  - Pan and Tompkins
  - Pan and Hamilton
  - None of these
60. Averaging 100 responses will improve the signal to noise ratio by what factor?
- 100
  - 10
  - 1
  - None of these
61. FIR filter has
- Finite impulse response
  - Linear phase
  - Stability
  - All of these
62. The storage space required for the 1600x1200 RGB image is
- 1.92 Mbytes
  - 5.76 Mbytes
  - 0.24 Mbytes
  - 0.72 Mbytes
63. The dynamic range of gray levels in an image can be compressed by using which of the following transformation
- $s = c \log_{10} |r|$
  - $s = c \log_{10} |r^2|$
  - $s = c \log_{10} (1 + |r|)$
  - $s = c \log_{10} (1 + |r^2|)$
64. One of the problem in region growing is
- To partition an image in to regions
  - To select the properties of a pixel
  - The formulation of a stopping rule
  - None of these
65. The detection of an isolated point in an image at the location on which the mask is centered if [R-response of the mask at any point in the image, T-non negative threshold]
- $|R| \geq T$
  - $|R| \leq T$
  - $|R| = T$
  - None of these

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**(SECTION - II)****(10 X 2 = 20)**

(Each question carries two marks)

66. Find linear attenuation coefficient of beam, if half value layer of an x-ray beam is at 3mm
- a. 0.131/mm      b. 0.231/mm  
c. 0.331/mm      d. None of these
67. What is the cardiac output when 10mg of indicator was injected and average concentration as calculated from curve was 5mg/l for a duration of 20sec?
- a. 4 L/min      b. 5 L/min  
c. 6 L/min      d. None of these
68. In nuclear instrumentation, heaviest and flow moving particles are
- a. Beta particles      b. Alpha particles  
c. Gamma rays      d. Protons
69. Ultrasonic transducers, if used without air backing produce
- a. Ringing effect      b. Ghost effect  
c. Spaghetti effect      d. Hall effect
70. The Inverse Laplace transform of the function  $(S+5)/(S+1)(S+3)$
- a.  $2e^{-t} - e^{-3t}$       b.  $2e^{-t} + e^{-3t}$   
c.  $e^{-t} - e^{-3t}$       d.  $e^{-t} + e^{-3t}$
71. Fourier transform of  $f(t)$  is  $\int_0^{\infty} \phi(t) \cos \omega t \, dt$  if and only if
- a.  $t$  is real and  $f(t)$  is real  
b.  $t$  is real and  $f(t)$  is even  
c.  $f(t)$  is real and  $f(t)$  is odd  
d. the function is  $f(t)e^{-j\omega t}$
72. The filter has  $H(z) = (z+1)/(z^2-2z+1)$ , it will be
- a. Stable      b. Unstable  
c. Marginally stable      d. None of these
73. If the sampling frequency is 200 Hz located zero at  $90^\circ$ , at what frequency it eliminates?
- a. 120 Hz      b. 200 Hz  
c. 90 Hz      d. 50Hz
74. The color model used for color monitoring and printing respectively are
- a. RGB, HSI      b. CMY, YIQ  
c. RGB, YIQ      d. RGB, CMY
75. The prewitt operator mask used in image processing along the y-direction is
- a.  $\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$       b.  $\begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix}$   
c.  $\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$       d.  $\begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

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**(IT: INSTRUMENTATION TECHNOLOGY)**

**PART - B (SECTION - I)**

(Each question carries one mark)

**(20 X 1 = 20)**

- 46 Largest deviation from the mean is
- a. Range of doubt
  - b. Possible error
  - c. Either a. or b.
  - d. Standard deviation
- 47 In modern measurement systems, undesirable static characteristics are
- a. Dead zone
  - b. Drift
  - c. Static error and non linearity
  - d. All of these
- 48 Dynamic response of a system consists of
- a. Steady static response only
  - b. Transient static response only
  - c. Both a. and b.
  - d. None of these
- 49 A second order under damped system has a damping factor of 0.8. If a sinusoidal input of unit amplitude is applied to it, the resonant peak of the output will be
- a. 25 %
  - b. 91 %
  - c. 110 %
  - d. None of above
- 50 Moire fringes are used to measure rotary displacement along with
- a. Contact type encoders only
  - b. Optical encoders only
  - c. Both a. and b.
  - d. None of above
- 51 When measuring strain, ballast circuits use a capacitor to act as high pass filter. This is done when
- a. Both static and dynamic strains are being measured.
  - b. Dynamic strains are being measured
  - c. Static strains are being measured
  - d. None of above

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- 52 Fluid friction damping can be used in
- Horizontally mounted instrument
  - Vertically mounted instrument
  - Both horizontally and vertically mounted instrument
  - None of these
- 53 Law of intermediate metals in thermocouples allows them to
- Use meters for measurement without disturbing the circuit connections
  - Use reference junction compensation
  - Both a. and b.
  - None of these
54. Pulse transfer function of a discrete data system is given by
- $C(s)/R(s)$       b.  $C(t)/R(t)$
  - $C(z)/R(z)$       d.  $C(n)/R(n)$
- 55 How is optimal control different from classical control?
- Systematic approach
  - Mathematically sound
  - Performance measure and constraints
  - All of these
- 56 For a cubic non linearity the describing function is  $K_N(X)$  is
- $X^2/4$       b.  $X^2/2$
  - $3X^2/4$       d.  $X^2$
- 57 Hemoglobin is contained in
- WBC's      b. RBC's
  - Platelets      d. Protein
- 58 Spectrophotometer uses
- Selection filter
  - Silver filter
  - Mono chromometer
  - chloridimeter
- 59 Average life of a radioactive substance with half life as 50 days is
- 42.15 days
  - 52.15 days
  - 62.15 days
  - 72.15 days

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- 60 When ECG is recorded by connecting two electrodes, one is on left arm and other is on left leg, recording is made in
- Lead I configuration
  - Lead II configuration
  - Lead I and Lead II configurations
  - Lead III configuration
- 61 Fourier transform of the signal  $X(t) = e^{-4jt}$  is
- $\frac{8}{16} + \omega^2$
  - $\frac{-8}{16} + \omega^2$
  - $\frac{4}{16} + \omega^2$
  - $\frac{-4}{16} + \omega^2$
- 62 Double integration of a unit step function would lead to
- An impulse
  - A Parabola
  - A Ramp
  - A doublet
- 63 The Laplace Transform of  $f(t) = t$  is given by
- $1/S^2$
  - $1/S$
  - $2/S^3$
  - S
- 64 The Z-transform of the time function  $\sum_{k=0}^{\infty} \delta(n-k)$  is
- $z - 1/z$
  - $Z/(Z-1)^2$
  - $Z/(Z-1)$
  - $(Z-1)^2/Z$
- 65 The discrete time system described by  $y(n) = x(n)^2$  is
- Causal, linear and time varying
  - Causal, non-linear and time varying
  - Non Causal, linear and time invariant
  - Non Causal, non-linear and time variant

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**(SECTION - II)**

(Each question carries two marks)

**(10 X 2 = 20)**

- 66 Accuracy is specified as  $\pm 0.5\%$  of true value. At 5% of full scale, error of instrument will be  
 a.  $\pm 0.5\%$                       b.  $\pm 0.0255\%$   
 c.  $\pm 5\%$                          d.  $\pm 25\%$
- 67 A copper constantan thermocouple with reference junction temperature at  $20^\circ\text{C}$  is used to measure an unknown temperature ( $E_{20}-E_0 = 0.7936\text{mv}$  the reading of potentiometer is  $2.877\text{mv}$  and slope of curve is  $0.04\text{mV}/^\circ\text{C}$ . The unknown temperature will be  
 a.  $46^\circ\text{C}$                          b.  $70.7^\circ\text{C}$   
 c.  $92^\circ\text{C}$                          d.  $86.6^\circ\text{C}$
- 68 Given  $F(z) = Z^3 - 3.3Z^2 - 3Z - 0.8 = 0$ , find the number of roots outside the circle  
 a. Zero                            b. One  
 c. Two                             d. None
- 69 Which of the following is performance measurement for quadratic regulator problem in optimal control system ?  
 a.  $\int_{t_0}^{t_f} X^T Q X + U^T R U dt$     b.  $\int_{t_0}^{t_f} dt$   
 c.  $\int_{t_0}^{t_f} |u| dt$                       d.  $\int_{t_0}^{t_f} U^2 dt$
- 70 By residual theorem the value of  $f(kT)$  are directly obtained by residues at poles of  $F(Z)$  is  
 a.  $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) Z^{k-1}$   
 b.  $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) / Z^{k-1}$   
 c.  $\sum_{\text{poles of } F(z)} \text{Residue of } F(Z) Z^k$   
 d.  $\sum_{\text{poles of } F(z)} \text{Residue of } F(z) / Z^k$
- 71 What is cardiac output when heart rate is 70beats/min and stroke volume is 60ml/beat  
 a. 4.2 l/m                         b. 4.5 l/m  
 c. 6 l/m                            d. 2.4 l/m
- 72 In a spectrophotometer the monochromator must be able to resolve two wavelength of 599.9nm and 600.1nm required resolution is  
 a. 1000                            b. 200  
 c. 3000                            d. 100
- 73 What is half life of radioactive material if activity drops to  $1/16^{\text{th}}$  of its initial value in 20 years  
 a. 2 years                         b. 4years  
 c. 5 years                         d. None
- 74 Given  $f(t) = 3e^{-4t}U(t)$ , Its Fourier Transform  $F(w)$  at  $W = 4$  is  
 a.  $1/(1+j)$                          b.  $(3/4)/(1+j)$   
 c.  $1/(1+4/3j)$                       d.  $(4/3)/(1+4/3j)$
- 75 Find FFT of [1,2,3,4]  
 a. [10,-2+2j,-2,-2-2j]         b. [2,2j,-2j,-2]  
 c. [10,2j,-2,-2j]                      d. [10,2,2j,-2j]

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**SEAL**