POST GRADUATE COMMON ENTRANCE TEST-2018

DATE and TIME	COURSE	SUBJECT
14-07-2018 2.30 p.m. to 4.30 p.m.	ME/M.Tech/M.Arch/ courses offered by VTU/UVCE/UBDTCE	ELECTRICAL SCIENCES (E & E / E & C / TC / BME & ME / IT)

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
100	150 Minutes	120 Minutes

MENTION YOUR PGCET NO.					QUESTION BOOKLET DETAILS	
					VERSION CODE	SERIAL NUMBER
					A	163205

DOs :

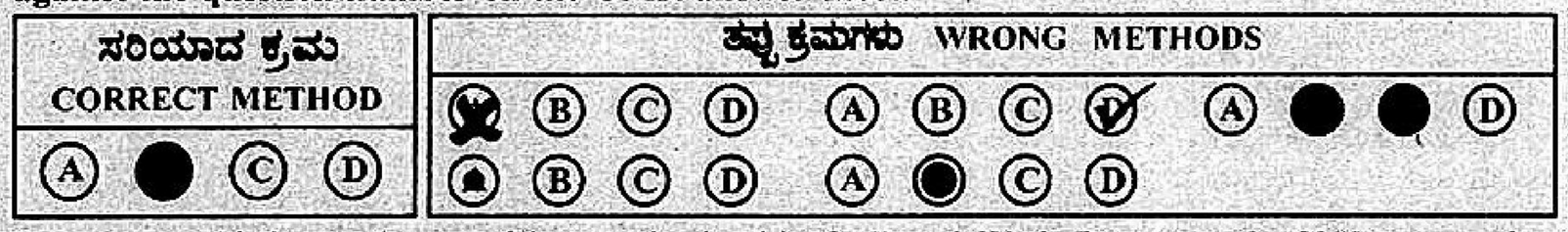
1. Candidate must verify that the PGCET number & Name printed on the OMR Answer Sheet is tallying with the PGCET number and Name printed on the Admission Ticket. Discrepancy if any, report to invigilator.
2. This question booklet is issued to you by the invigilator after the **2nd bell i.e., after 2.25 p.m.**
3. The Version Code of this Question Booklet should be entered on the OMR Answer Sheet and the respective circle should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. 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 2.30 p.m., till then;**
   - Do not remove the paper seal / polythene bag 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 2.30 p.m.,** remove the paper seal / polythene bag 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 4.30 p.m.,** stop marking on the OMR answer sheet and affix your **left hand thumb impression** on the OMR answer sheet as per the instructions.
6. Handover 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 : $30 \times 1 = 30$ (Section 2) 15 Questions : $15 \times 2 = 30$
PART-B : (Section 1) 20 Questions : $20 \times 1 = 20$ (Section 2) 10 Questions : $10 \times 2 = 20$

EE - A

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(Common to E & E / E & C / TC / BME & ME / IT)

PART – A

(SECTION – I)

Each question carries one mark. **(30 × 1 = 30)**

1. Maximal directional derivative of $\phi = x + y + z$ at (1, 2, 3) is

(A) $-\sqrt{3}$ (B) $\sqrt{3}$

(C) 3 (D) –3

2. $\lim_{x \to 2} \left[\frac{2^x - 4}{x - 2}\right]$ is

(A) $\log_e 2$ (B) $\log_e 4$

(C) $\log_e 8$ (D) $\log_e 16$

3. For independent events A and B with P(A) = 0.3, P(B) = 0.2, then $P(A \cup B)$ is

(A) 0.44 (B) 0.4

(C) 0.55 (D) 0.5

4. Standard form of one-dimensional wave equation is

(A) $C^2\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ (B) $C^2\frac{\partial u}{\partial x} = \frac{\partial^2 u}{\partial t^2}$

(C) $C^2\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ (D) $C^2\frac{\partial u}{\partial x} = \frac{\partial u}{\partial t}$

5. $\int_0^\infty e^{-3t} \sin 4t dt$ is equal to

(A) $\frac{4}{25}$ (B) $\frac{4}{7}$

(C) $\frac{3}{25}$ (D) $\frac{3}{7}$

6. In Poisson distribution, mean and standard deviation respectively are

(A) np & np

(B) np & $\sqrt{np}$

(C) np & n^2p^2

(D) n^2p^2 & np

7. In the circuit shown in Fig. 7, the number of nodes is

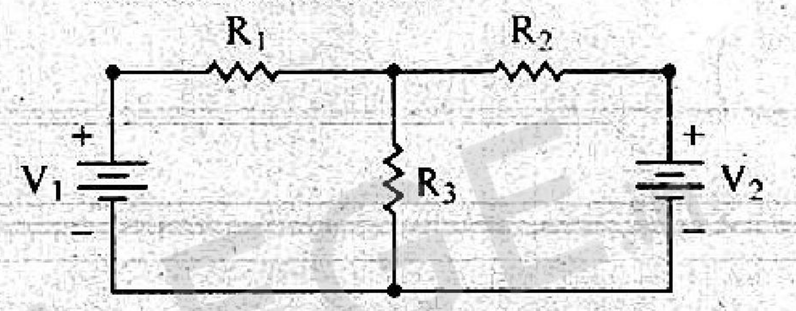


Fig. 7

(A) one (B) two

(C) three (D) four

8. The circuit shown in Fig. 7 has _____ branches.

(A) two

(B) four

(C) three

(D) None of these

9. The superposition theorem is used when the circuit contains

(A) a single voltage source

(B) number of voltage sources

(C) passive elements only

(D) none of the above

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10. In the Fig. 10 shown the value of Thevenin's voltage E_{TH} is

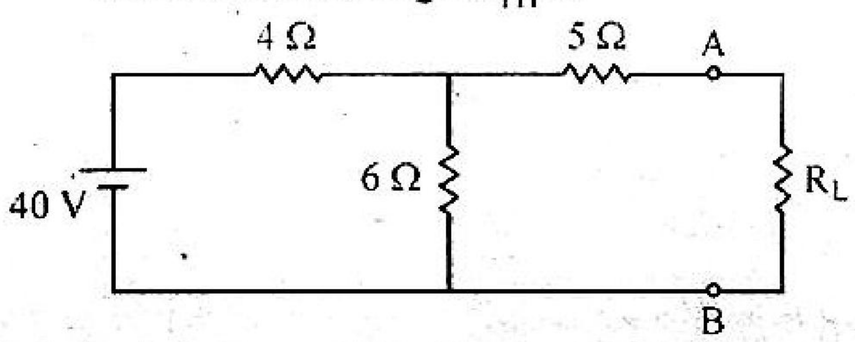


Fig. 10

(A) 20 V (B) 24 V
(C) 12 V (D) 36 V

11. Divergence of gradient of scalar potential V is

(A) $\nabla.\nabla V = 0$ (B) $\nabla.\nabla V = \nabla V^2$
(C) $\nabla.\nabla V = \nabla^2 V$ (D) $\nabla.\nabla V = 1$

12. Electric flux density D for a metallic surface having surface charge density ρ_s c/m^2 is

(A) $D = \rho_s$ (B) $D = 2\rho_s$
(C) $D = 0$ (D) $D = \rho_s/2$

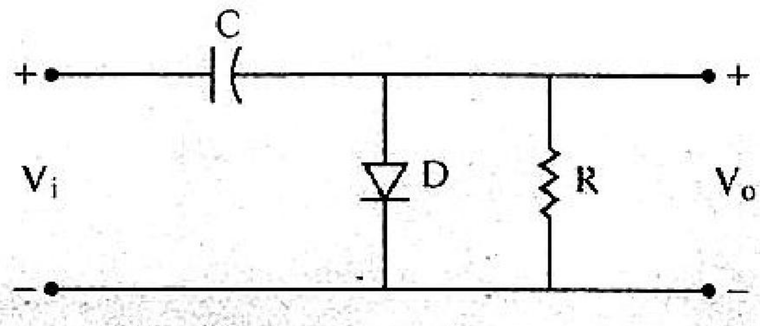
13. Maximum efficiency of a Class-B power amplifier is

(A) 25% (B) 50%
(C) 78.54% (D) 90%

14. The gain bandwidth product of a two stage CE amplifier is

(A) greater than that of one stage
(B) less than that of one stage.
(C) same as that of one stage.
(D) product of the two gain bandwidth products of each stage.

15. What is the circuit in the given diagram called ?



(A) Clipper
(B) Clamper
(C) Rectifier
(D) Lowpass filter

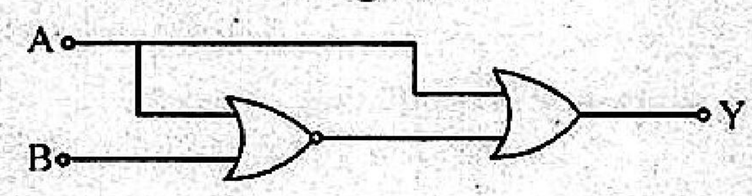
16. Convert $(2604.105)_{10} = (\ ?\ )_{16}$

(A) A2C.69 (B) A2C.1BE
(C) A2C.1AE (D) A2C.1CE

17. Simplified expression of $Y = A + \bar{A}B$ is

(A) $A + B$ (B) $\bar{A} + B$
(C) AB (D) $A + \bar{B}$

18. The output Y for the logic circuit shown in the figure is



(A) $\bar{A} + \bar{B}$ (B) $\bar{A}\,\bar{B}$
(C) $A\bar{B}$ (D) $A + \bar{B}$

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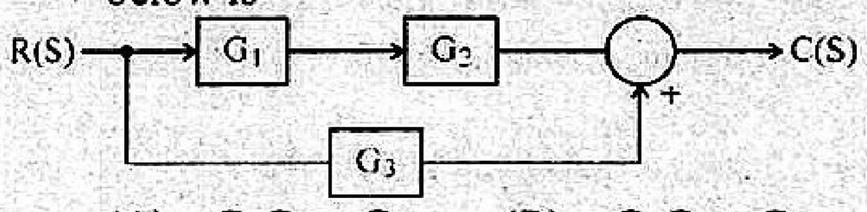
19. The mass in mechanical system is analogous to _____ in FI analogous system.
(A) Capacitance (B) Resistance
(C) Inductance (D) Flux

20. The system with characteristic equation
$s^4 + 3s^3 + 6s^2 + 2s + 3 = 0$ is
(A) Unstable
(B) Marginally stable
(C) Oscillating
(D) Absolutely stable

21. Gain margin is a factor by which system gain can be increased to drive it to verge of
(A) stability
(B) instability
(C) oscillating
(D) initial damping

22. The maximum overshoot of a 2nd order system subject to unit step input can be reduced by
(A) reducing damping frequency
(B) reducing damping factor
(C) increasing damping factor
(D) increasing damping frequency

23. The equivalent of the system shown below is



(A) $G_1G_2 + G_3$ (B) $G_1G_2 - G_3$
(C) $\frac{G_1G_2}{1 - G_1G_2G_3}$ (D) $\frac{G_1G_2}{1 + G_1G_2G_3}$

24. The corner frequency for the system with $GH(s) = \frac{30}{s(s+2)(s^2+2s+2)}$ are
(A) 0.5 r/sec, 0.707 r/sec
(B) 0.5 r/sec, 1.41 rad/sec
(C) 2 r/sec, 0.707 r/sec
(D) 2 r/sec, 1.41 rad/sec

25. Size of on-chip ROM for 8051 microcontroller is
(A) 4 kbytes (B) 16 kbytes
(C) 128 bytes (D) 64 kbytes

26. Instruction to mask the LSB of 'A' register content in 8051 is
(A) ANL A, # 7F
(B) ANL A, # FD
(C) ANL A, # FE
(D) ANL A, # FF

27. Calculate the size of instruction :
MOV A, R_2 in 8051
(A) 4 bytes (B) 3 bytes
(C) 2 bytes (D) 1 byte

28. PSW value for selecting Bank-3 in 8051 is
(A) 08 H (B) 18 H
(C) 00H (D) 01H

29. The value of TMOD register to operate Timer-1 in Mode-2 is
(A) 02 H (B) 40 H
(C) 20 H (D) 10 H

30. In 8051, the highest priority interrupt is
(A) INT 1 (B) TF 1
(C) TF 0 (D) INT 0

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(SECTION – II)

Each question carries two marks. **(15 × 2 = 30)**

31. For $u = \log\left[\frac{x^3 + y^3}{xy^4}\right]$, $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is equal to

(A) 1 (B) – 1

(C) 2 (D) –2

32. Eigen values of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ are

(A) 2, 2, 4 (B) 1, 2, 5

(C) 0, 1, 6 (D) –2, 3, 6

33. Solution of $x^2y'' - 3xy' + 4y = 0$ is

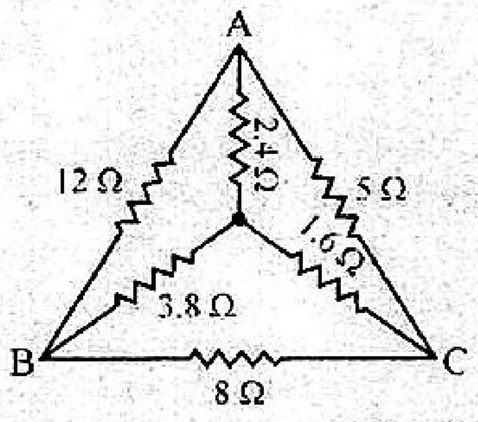
(A) $(C_1 + C_2x)e^{2x}$

(B) $(C_1 + C_2x)e^{-2x}$

(C) $(C_1 + C_2 \log x)x^2$

(D) $(C_1 + C_2 \log x)\, e^{2x}$

34. Find the equivalent resistance between B and C.



(A) 1Ω (B) 2.709 Ω

(C) 5.7 Ω (D) 10 Ω

35. A series RLC circuit has R = 10 Ω, L = 0.1 H, C = 100 μF and is connected across 200 V, variable frequency source. Find resonant frequency and voltage drop across C & L at this frequency.

(A) 100 Hz, 300 V

(B) 500 Hz, 600 V

(C) 50.34 Hz, 632 V

(D) 1000 Hz, 600 V

36. Expression for field intensity E for an infinite length of wire is given at (linear charge density ρ_l C/m)

(A) $\rho_l/2\pi\varepsilon$ (B) $\rho_l/2\pi$

(C) $\rho_l/(2\pi\varepsilon h)$ (D) $\rho_l/2$

37. In a JKFF, $J = \overline{Q}$ and K = 1. Assuming the FF was initially cleared and then clocked for 6 pulses, the sequence at the Q output will be

(A) 010000 (B) 010010

(C) 010101 (D) 011001

38. A counter with 10FFs is initialized to 0. What will be the count after 2060 pulses ?

(A) 000 000 1100

(B) 000 001 1100

(C) 000 001 1000

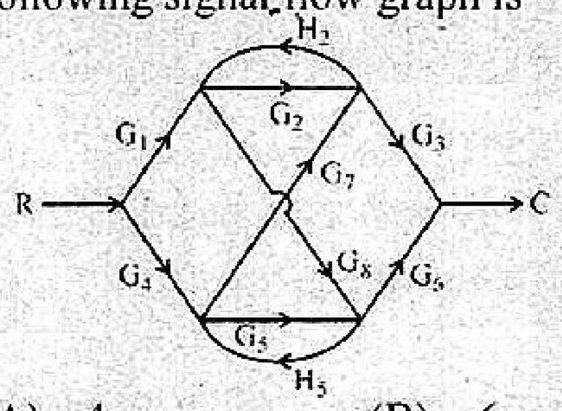
(D) 000 000 1110

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39. A crystal has the following parameters L = 3H, C_S = 0.05 pF, R = 2 kΩ and C_M = 10 pF. Calculate the parallel resonant frequency of the crystal.
(A) 410.9 kHz (B) 411.7 kHz
(C) 510.9 kHz (D) 511.7 kHz

40. The number of forward path in the following signal flow graph is



(A) 4 (B) 6
(C) 2 (D) 8

41. A system with $GH(s) = \frac{8}{s(s^2 + 2s + 4)}$ oscillates at a frequency of
(A) 6 r/sec (B) 4 r/sec
(C) 2 r/sec (D) 5 r/sec

42. State space representation of a system with equation
y''' + 6y'' + 10y' + 5y = u is $x' = Ax +$ BuThe matrix A is
(A) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & -10 & -6 \end{bmatrix}$
(B) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ -5 & -10 & -6 \end{bmatrix}$
(C) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ -6 & -10 & -5 \end{bmatrix}$
(D) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -5 & -10 & -6 \end{bmatrix}$

43. Find the content of register 'A' after executing the following set of instructions :
CLR A
ORL A, # 99H
RR A
(A) 66 H
(B) 99 H
(C) 33 H
(D) CC H

44. What is the content of R_3 after executing the following instructions :
MOV A, #220
CPL A
MOV R_3, A
(A) 43 H
(B) 23 H
(C) 13 H
(D) 33 H

45. For an 8051 system of 11.0592 MHz, find the time delay for the following code:
MOV R_1, #200
UP : NOP
NOP
DJNZ R_1, UP
(A) 869 μs
(B) 742 μs
(C) 272 μs
(D) 421μs

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(E & E : ELECTRICAL AND ELECTRONICS ENGINEERING)

PART – B

(SECTION – I)

Each question carries one mark. **(20 × 1 = 20)**

46. Which of the following DC generators cannot build up on open circuit ?

(A) Series (B) Shunt
(C) Long Shunt (D) Short Shunt

47. If field resistance of DC shunt generator is increased beyond its critical value, then the generator

(A) output voltage will exceed name plate rating.
(B) fails to build up.
(C) may burn out if loaded to its name plate rating.
(D) power output may exceed name plate details.

48. The effect of increasing air gap in induction motor will result in increase of

(A) power factor
(B) speed
(C) air gap flux
(D) magnetizing current

49. The condition for maximum torque under running condition of Induction motor is

(A) $R_2 = SX_2$ (B) $X_2 = SR_2$
(C) $R_2 = X_2/S$ (D) $R_2 = X_2$

50. For eliminating 7^{th} harmonics from emf wave the armature of alternator should be having fractional pitch of

(A) 2/3 (B) 5/6
(C) 7/8 (D) 6/7

51. Open circuit test on a transformer is always made with _____ winding open circuited.

(A) low voltage
(B) high voltage
(C) low voltage or high voltage
(D) none of these

52. When primary of transformer is connected to DC supply, then

(A) primary draws smaller current
(B) primary leakage reactance is increased
(C) core loss increases
(D) primary winding may burn out

53. The no-load input of transformer is practically equal to

(A) copper loss
(B) eddy loss
(C) iron loss
(D) stray loss

54. A 150 kVA, 2200/110 V transformer has iron loss of 1 kW. The maximum efficiency occurs when copper loss is

(A) 1.5 kW (B) 2 kW
(C) 0.5 kW (D) 1 kW

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55. Saving of copper in autotransformer is _____ times the weight of copper required for 2 winding transformer.
(A) K (B) 1 – K
(C) 2K (D) 2(1 – K)

56. The thermal efficiency of a steam power station is about
(A) 28% (B) 69%
(C) 80% (D) 75%

57. The load factor (L.F.), maximum demand (M.D.), average load (A.L.) are related as
(A) $L.F. = \frac{A.L}{M.D.}$
(B) $L.F. = A.L. \times M.D.$
(C) $L.F. = \frac{M.D.}{A.L.}$
(D) $L.F. = M.D.$

58. The correct relation in the following is
(A) $kVAR = kW \sin \phi$
(B) $kVAR = kW \tan \phi$
(C) $kVAR = kW \cos \phi$
(D) None

59. Cables and lines are mostly
(A) Inductive (B) Capacitive
(C) Resistive (D) None

60. The short circuit kVA is maximum when fault occurs
(A) near the generator
(B) at the end of transmission line
(C) in the middle of transmission line
(D) all of the above

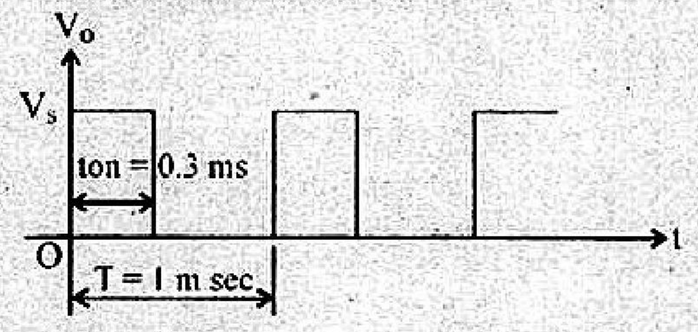
61. The correct relation for the operator $a = 1\angle 120°$ is
(A) $1 + a + a^2 = 0$ (B) $a + a^2 = 1$
(C) $1 + a^3 = 0$ (D) $a^2 + a^3 = 1$

62. The safest mode of triggering SCR is
(A) high voltage across A-K
(B) dv/dt exceeds the limit
(C) gate drive
(D) thermal effect

63. The voltage blocking capability of a switch is increased by
(A) heavily doped n^- drift layer
(B) lightly doped n^- drift layer
(C) area of cross-section of layers
(D) inserting capacitor across switch

64. Reverse recovery time of a diode is 3 μs and the rate of fall of the diode current is di/dt = 30 A/μs,then peak reverse current I_{RR} is
(A) 10 A (B) 0.1 A
(C) 9 A (D) 90 A

65. Given supply voltage V_s = 10 V, the average value output voltage for the waveform shown is



(A) 30 V (B) 3 V
(C) 0.3 V (D) 0.03 V

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(SECTION – II)

Each question carries two marks. **(10 × 2 = 20)**

66. A 220 V shunt motor develops a torque of 54 Nm at armature current of 10 A. The torque developed at armature current of 20 A is

(A) 54 Nm (B) 81 Nm
(C) 108 Nm (D) 27 Nm

67. A 6-pole, 50 Hz, 3ϕ induction motor is running at 950 rpm and has rotor copper loss of 5 kW. Its rotor input is

(A) 100 kW (B) 10 kW
(C) 95 kW (D) 5.3 kW

68. A 3ϕ, 4-pole, 440 V induction motor has synchronous speed of 1500 rpm and has slip of 5%. The frequency of rotor emf is

(A) 4 Hz (B) 2 Hz
(C) 3 Hz (D) 5 Hz

69. A transformer has flux density of 1.6 tesla, frequency of 50 Hz, area of iron in core= 0.0707 m^2. The emf per turn induced will be

(A) 10.65 V (B) 25.1 V
(C) 7.95 V (D) 106.56 V

70. A transformer delivering 100 kW at UPF has copper loss of 2 kW at this load. The maximum efficiency will be

(A) 94.56% (B) 96.15%
(C) 98.04% (D) 99.1%

71. A 50 kVA transformer has iron loss of 500 W, full load copper loss of 800 W. The efficiency at full load, 0.8 pF lag is

(A) 92% (B) 89.56%
(C) 96.85% (D) 95.82%

72. A workshop is consuming 500 kW at 0.707 pF lagging. A synchronous motor is connected to improve the P.F. to 0.95 lagging. The leading reactive power supplied by the synchronous motor is

(A) 250 kVAR (B) 228 kVAR
(C) 150 kVAR (D) 336 kVAR

73. The currents in a 3ϕ unbalanced system are $\vec{IR}$ = (12 + j6)A; $\vec{IY}$ = (12 – j12)A; $\vec{IB}$ = (–15 + j10)A. The phase sequence is RYB. The zero phase sequence component in R phase is

(A) (1.5 + j2.3)A
(B) (3 + j 1.33)A
(C) (2.8 + j 6.7)A
(D) (1.5 + j 0.15)A

74. A UJT triggering circuit is connected across a 20 V zener. The valley and peak voltages are 1 V & 15 V respectively. The intrinsic stand off ratio is 0.75. It operates at a frequency of 1200 Hz. Find the charging capacitance of R = 5.6 kΩ.

(A) 10.7 μF (B) 1.07 μF
(C) 0.107 μF (D) 0.0107 μF

75. A plywood having capacitance of 14.76 pF is subjected to dielectric heating at 20 MHz. The power observed is 400 W and δ = 0.05. The voltage required for heating is

(A) 1076 V (B) 2076 V
(C) 3076 V (D) 8076 V

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PART - B

(SECTION – I)

Each question carries one mark. **(20 × 1 = 20)**

46. The minimum number of transistor required to implement 2 input X-OR Gate in CMOS technology :

(A) 2

(B) 4

(C) 6

(D) 8

47. The Gate capacitance (C_g) of a MOSFET is given by

(A) $C_g = C_o$ L.W.

(B) $C_g = C_o \frac{W}{L}$

(C) $C_g = C_o \frac{L}{W}$

(D) $C_g = \frac{W.L}{C_o}$

48. In Embedded systems the initialization routine is often referred as

(A) Initial program

(B) Bootstrap program

(C) Reboot program

(D) Starting program

49. The input and output of a continuous time system are represented by $x(t)$ and $y(t)$ respectively. Which of the following corresponds to a causal system ?

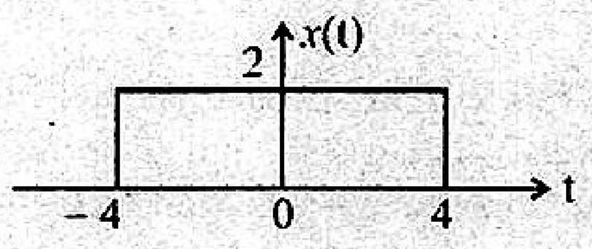
(A) $y(t) = (t+4)\,x(t-1)$

(B) $y(t) = (t+5)\,x(t+1)$

(C) $y(t) = (t-4)\,x(t+2)$

(D) $y(t) = x(t-3) + x(t+2)$

50. The average power (P) and energy (E) of the signal $x(t)$ shown in figure below is



(A) P = 16 W, E = 32 J

(B) P = 0, E = 32 J

(C) P = 0, E = 16 J

(D) P = ∞, E = 48 J

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51. The number of stages required to compute 512-point DFT using Radix-2 DIF FFT algorithm is

(A) 9

(B) 8

(C) 7

(D) 6

52. Four independent messages have bandwidth of 100 Hz, 100 Hz, 200 Hz and 400 Hz respectively. Each is sampled at Nyquist rate and samples are Time Division Multiplexed (TDM) and transmitted. The transmitted sample rate (in Hz) is

(A) 800

(B) 1600

(C) 400

(D) 3200

53. In PCM, if the number of quantization levels is increased from 4 to 64, then the bandwidth requirement will approximately equal to

(A) 3 times

(B) 4 times

(C) 2 times

(D) 16 times

54. A modulated signal is given by $\delta(t) = e^{-at} \cos[(w_c + \Delta w)t]u(t)$ where a, w_c and Δw are positive constants and $w_c >> \Delta w$ the complex envelope of $\delta(t)$ is given by

(A) $e^{-at} e^{-j (w_c + \Delta w)t.u(t)}$

(B) $e^{-at} e^{-j \Delta wt.u(t)}$

(C) $e^{-j \Delta wtu(t)}$

(D) $e^{j (w_c + \Delta w)t}$

55. The thermal noise power contribution is limited only by the _____ of the circuit.

(A) Bandwidth

(B) Boltzman's constant

(C) Resistor

(D) Temperature

56. Directivity of an Isotropic radiator is

(A) 0 (B) 1

(C) 2 (D) 3

57. Unit of Beam area is

(A) m^2

(B) degrees

(C) steradians

(D) radians

Space For Rough Work

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58. VSWR of a short circuited transmission line is

(A) 0 (B) 1

(C) 10 (D) ∞

59. Dominant mode of wave propagation in a circular waveguide is

(A) TE_{00} (B) TE_{01}

(C) TE_{10} (D) TE_{11}

60. In an SCR, the angle of conduction can be changed by changing

(A) Anode voltage

(B) Forward current rating

(C) Anode current

(D) Gate current

61. Which power device is most suitable for high frequency (> 100 kHz) switching application ?

(A) Power MOSFET

(B) BJT

(C) Schottky diode

(D) IGBT

62. _____ commutation is usually used in phase controlled rectifiers.

(A) Line

(B) Load

(C) Forced

(D) External-pulse

63. Instruction to perform 2's complement of a source in 8086 is

(A) CPL

(B) NOT

(C) NEG

(D) CMC

64. Which of the following is not a data transfer instruction in 8086 ?

(A) DAA

(B) MOV

(C) POP

(D) PUSH

65. IN BSR mode, only PORT-C can be used to

(A) reset individual port bits

(B) set and reset individual port bits

(C) set individual port bits

(D) None of the above

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(SECTION – II)

Each question carries two marks. **(10 × 2 = 20)**

66. The drain of an n-channel MOSFET is shorted to the gate so that $V_{GS} = V_{DS}$. The threshold Voltage (V_T) of MOSFET is 1 V. If the drain current I_D is 1 mA for $V_{GS} = 2V$, then for $V_{GS} = 3V$ I_p is

(A) 2 mA (B) 3 mA

(C) 9 mA (D) 4 mA

67. A depletion type N-channel MOSFET in biased in its region for use as a voltage controlled resistor. Assume threshold voltage $V_{Th} = 0.5$ V, $V_{GS} = 2.0$ V, $V_{DS} = 5V$, W/L = 100, $C_{ox} = 10^{-8}F/cm^2$ and $\mu_n = 800$ $cm^2/V\text{-}s$. The value of the resistance of the voltage controller resistor (in Ω) is

(A) 100 Ω (B) 200 Ω

(C) 300 Ω (D) 500 Ω

68. Two discrete time LTI systems with impulse responses $h_1(n) = \delta(n-2)$ and $h_2(n) = \delta(n-3)$ are connected in cascade. The overall impulse response of the cascaded system is

(A) $\delta(n+1)$

(B) $\delta(n-2) + \delta(n+3)$

(C) $\delta(n-2) \cdot \delta(n-3)$

(D) $\delta(n-5)$

69. Fourier transform of the signal $x(t) = e^{-t}u(t)$ is $\frac{1}{1+jw}$, then the Fourier transform of the signal $x(t) + x(-t)$ is

(A) $\frac{j\,2w}{1+w^2}$

(B) $\frac{jw}{1+w^2}$

(C) $\frac{2}{1+w^2}$

(D) $\frac{2w}{1+w^2}$

Space For Rough Work

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70. The maximum power efficiency of an AM Modulation is

(A) 25%

(B) 50%

(C) 75%

(D) 100%

71. A communication channel with AWGN, has a bandwidth of 4 kHz and SNR of 15. Its channel capacity is

(A) 1.6 kbps

(B) 16 kbps

(C) 32 kbps

(D) 256 kbps

72. Find the HPBW of an antenna whose E-field pattern varies as $1 + \cos\theta$.

(A) 113°

(B) 131°

(C) 311°

(D) 65°

73. A single phase voltage controller has input of 230 V and resistive load of 15 Ω. For 6 cycles 'ON' and 4 cycles 'OFF' determine RMS output voltage.

(A) 189 V (B) 260 V

(C) 156 V (D) 178 V

74. In 8086, if AL = 43 H and BL = 28 H, what will be the content of accumulator after executing the following :

```
ADD AL, BL
DAA
```

(A) 51 H

(B) 71 H

(C) 81 H

(D) 61 H

75. In 8086, if CS = 538A H and IP = 1234 H, calculate the 20-bit physical address.

(A) 54BD4 H

(B) 54AE4 H

(C) 65BE0 H

(D) 54AD4 H

Space For Rough Work

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(BME& ME : BIO-MEDICAL ENGINEERING & MEDICAL ELECTRONICS)

PART – B

(SECTION – I)

Each question carries one mark. **(20 × 1 = 20)**

46. The most widely used lossless image compression format on the internet is

(A) JPG (B) PNG

(C) GIF (D) MPG

47. A system is said to be defined as non-causal, when

(A) the output at the present depends on the input at an earlier time.

(B) the output at the present does not depend on the factor of time at all.

(C) the output at the present depends on the input at the current time.

(D) the output at the present depends on the input at a time instant in the future.

48. The discrete time system described by $Y(n) = X(n^2)$ is

(A) causal, linear and time invariant

(B) causal, linear and time variant

(C) non-causal, linear and time invariant

(D) non-causal, linear and time variant

49. The spin-echo technique in MRI is developed to remove the effect of

(A) Motion artifacts

(B) Thermal Noise

(C) Stray electromagnetic effects

(D) H-field in homogeneity

50. Pacemaker used for patients having permanent heart block is

(A) Atrial triggered pacemaker

(B) Bifocal demand pacemaker

(C) R-wave triggered pacemaker

(D) Fixed rate pacemaker

51. The pacemaker is characterized by the code VDD. The first letter V indicates

(A) Ventricle paced

(B) Ventricle sensed

(C) Ventricle triggered

(D) Ventricle inhibited

Space For Rough Work

ZOLLEGE.in

52. Radiographic grids are made up of

(A) Yittrium tantalate

(B) Phosphor

(C) Calcium

(D) Lead

53. In X-ray film processing, amplification of latent image takes place during

(A) Development

(B) Replenishment

(C) Fixing

(D) Washing

54. Evaluation of the Grid performance is based on

(A) Grid ratio

(B) Grid pattern

(C) Grid thickness

(D) Bulky factor

55. In Sonography, a picture of a slice of tissue is produced by

(A) A-mode scanning

(B) B-mode scanning

(C) C-mode scanning

(D) M-mode scanning

56. Electrodes used for EMG signals is

(A) Surface electrode

(B) Ring electrode

(C) Suction electrode

(D) Needle electrode

57. A pattern of electrodes placed on the scalp in measurement of EEG is called

(A) Frontage (B) Tonage

(C) Scalpage (D) Montage

58. Impedance pneumography is a technique for the measurement of

(A) Blood flow rate

(B) Heart rate

(C) Respiration rate

(D) Body temperature

59. Low energy radiation encountering the electron of an atom, setting it into vibrations at the frequency of the radiation.This phenomenon is called as

(A) Photo disintegration

(B) Photoelectric effect

(C) Crompton effect

(D) Coherent scattering

Space For Rough Work

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60. In blood pressure measurement the pressure from systolic towards diastolic is bled off in the range

(A) 1 – 2 mm Hg/s

(B) 2 – 3 mmHg/s

(C) 3 – 5 mmHg/s

(D) 5 – 10 mm Hg/s

61. EEG waveform obtained in the frequency range of 8 Hz to 1.3 Hz are called as

(A) Delta

(B) Theta

(C) Alpha

(D) Beta

62. For the measurement of ECG, the electrode placement between left arm and left leg is called

(A) Lead I

(B) Lead II

(C) Lead III

(D) Lead IV

63. Which of the following defines rectangular window function of length M – 1 ?

(A) W(n) = 1, n = 0, 1, 2 .... M – 1;
0 elsewhere

(B) W(n) = 1, n = 0, 1, 2 .... M – 1;
– 1 elsewhere

(C) $W_n(n) = 0$, n = 0, 1, 2 .... M – 1;
1 elsewhere

(D) W(n) = –1, n = 0, 1, 2, ... M – 1;
0 elsewhere

64. In sonography the coefficient for the flat tissue is

(A) 0.18 dB/cm

(B) 0.63 dB/cm

(C) 0.85 dB/cm

(D) 1.00 dB/cm

65. The concurrent use of continuous RF current for cutting and coagulation is called

(A) Polarization

(B) Hemostasis

(C) Electrotomy

(D) Thermostat

Space For Rough Work

ZOLLEGE.in

(SECTION – II)

Each question carries two marks. $(10 \times 2 = 20)$

66. Fourier transform of a rectangular pulse is
(A) Another rectangular pulse
(B) Triangular signal
(C) Sinc function
(D) Impulse function

67. IN IIR digital filter, the present output depends on
(A) present and previous inputs only
(B) present input and previous outputs only
(C) present input only
(D) present input, previous input and output

68. A signal $x_1(t)$ and $x_2(t)$ constitute real and imaginary parts respectively of a complex valued $x(t)$. What form of waveform does $x(t)$ possess ?
(A) Real symmetric
(B) Complex symmetric
(C) Asymmetric
(D) Conjugate symmetric

69. The decay constant for the radio nuclide having the half-life of 8.04 days is
(A) 0.693/day (B) 0.863/day
(C) 0.804/day (D) 0.086/day

70. The convolution sum of two sequences
X(n) = {3, 2, 1, 2}
and h(n) = {1, 2, 1, 2}
(A) Y(n) = {3, 8, 8, 12, 9, 4, 4}
(B) Y(n) = {3, 8, 3, 12, 9, 4, 4}
(C) Y(n) = {3, 8, 8, 12, 9, 1, 4}
(D) Y(n) = {3, 8, 8, 1, 9, 4, 4}

71. What is the Nyquist rate for the signal given :
$x(t) = \cos 2000\,\pi t + 3 \sin 6000\,\pi t$
(A) 2 kHz (B) 4 kHz
(C) 12 kHz (D) 6 kHz

72. The resultant vector formed in an Einthovens triangle is for which of the Lead combination ?
(A) I + III = II (B) I – III = II
(C) I + II = III (D) II + III = I

73. Calculate the maximum frequency of a Doppler-Ultrasound blood flowmeter, that has a carrier frequency of 7 MHz, a transducer angle of 45°, blood velocity of 150 cm/s and an acoustic velocity of 1500 m/s
(A) 1 kHz (B) 10 kHz
(C) 14 kHz (D) 19 kHz

74. The convolution of f(t) with itself is given to be $\int_0^t f(t).dt$, then what is f(t) ?
(A) The unit ramp function
(B) Equal to 1
(C) The unit step function
(D) The unit impulse function

75. The Fourier transform of f(t) is F(jW), then what is the Fourier transform of f(–t) ?
(A) F(jW)
(B) F(–jW)
(C) –F(jW)
(D) Complex conjugate of F(jW)

Space For Rough Work

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(IT : INSTRUMENTATION TECHNOLOGY)

PART – B

(SECTION – I)

Each question carries one mark. **(20 × 1 = 20)**

46. The difference between the measured value and true value is

(A) Gross error

(B) Relative error

(C) Probable error

(D) Absolute error

47. According to Gaussian Statistical Analysis, if the confidence interval is 0.80, then the values lying outside the confidence interval are

(A) 1 in 5

(B) 1 in 10

(C) 1 in 20

(D) 8 in 10

48. Error caused by the act of measurement on the physical system being tested is

(A) Hysteresis error

(B) Random error

(C) Systematic error

(D) Loading error

49. Two strain gauges are used to measure strain in cantilever. One gauge is mounted on the top of the cantilever and other is placed at the bottom. Two strain gauges form, two arms of Wheatstone's bridge. The bridge configuration is called as

(A) a quarter bridge

(B) a half bridge

(C) a full bridge

(D) a null bridge

50. The function of a reference electrode in a pH meter is to

(A) produce a constant voltage

(B) provide temperature compensation

(C) provide a constant current

(D) measure average pH value

51. The most light sensitive transducer for conversion of light into electrical power is

(A) Photodiode

(B) Solar cell

(C) Photovoltaic cell

(D) Photo conductive cell

Space For Rough Work

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52. The technique used to analyse the property of Radiation diffraction is

(A) Photometry

(B) Coulometry

(C) X-ray spectroscopy

(D) Calorimetry

53. Lenses used in optical filters are made up of

(A) Aluminium

(B) Gold

(C) Copper

(D) Fused silica

54. The wavclcngth calibration of a spectrophotometer can be checked by

(A) Aluminium filter

(B) Holomium oxide filter

(C) Beryllium filter

(D) Synthetic quartz filter

55. The dielectric layer used in interference filters of spectrophotometers is

(A) ZnS

(B) $Ba_2Ta_2O_6$

(C) SiO_2

(D) CSO_4

56. The inverse Fourier transform of $\delta(f)$ is

(A) u(t)

(B) 1

(C) $\delta(t)$

(D) $e^{j2\pi t}$

57. Which one of the following can act as an inverse transducer ?

(A) LVDT

(B) Strain gauge

(C) Piezoelectric crystal

(D) Bimetal strip

58. The process of imitating one system with another so that the imitating systems accepts the same data, executes same programs and achieves same results – as the imitated systems is known as

(A) Simulation

(B) Modification

(C) Translation

(D) Emulation

59. A servo motor is mainly used for

(A) Position control

(B) Velocity control

(C) Acceleration control

(D) Both velocity and acceleration control

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60. Deuterium discharge lamp has the wavelength in the range :

(A) 60 – 90 nm

(B) 90 – 140 nm

(C) 160 – 360 nm

(D) 450 – 600 nm

61. The frequency range of the signal is in the range of 10^{15} to 10^{17} Hz. This belong to the radiation band of

(A) Gamma rays

(B) Ultraviolet rays

(C) X-rays

(D) Infra-red

62. Typical current used in stimulation of cardiac cells for the clinical applications of cardiac defibrillation is

(A) 50 – 200 mA

(B) 10 – 100 mA

(C) 0.25 – 35 mA

(D) 1 to 10 mA

63. OTDR is the acronym for

(A) Optical Time Domain Reflectometry

(B) Optical Transmission and Detection Ratio

(C) Optical Time Domain Deflection Region

(D) Optical Transmission and Deflection Ratio

64. Optical pyrometer is used to measure

(A) Low Pressure

(B) Low Temperature

(C) High Temperature

(D) High Pressure

65. Which one of the following quantities can be measured with the help of piezoelectric crystal ?

(A) Acceleration

(B) Flow

(C) Temperature

(D) Velocity

Space For Rough Work

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(SECTION – II)

Each question carries two marks. **(10 × 2 = 20)**

66. A 0 – 150 V voltmeter has accuracy of 1% of full scale reading. The voltage measured by the instrument is 75%. The limiting error is

(A) 1% (B) 2%
(C) 2.5% (D) 3%

67. A 1 m length wire has a resistance of 150 Ω when it is subjected to strain, its length becomes 1.01 m. The measurement is conducted by a strain gauge whose gauge factor is 2. The change in resistance of the wire is

(A) 0.5 Ω (B) 1.0 Ω
(C) 2.0 Ω (D) 3.0 Ω

68. Experiments conducted with ultraviolet light of wavelength 1.800×10^{-5} cm show that electrons of maximum energy 1.51 eV are ejected from a certain metal. If Planck's constant is 6.62×10^{-27} erg.sec, the photoelectric threshold of the metal is about

(A) 3.4 eV (B) 4.8 eV
(C) 5.4 eV (D) 5.0 eV

69. A 5 channel DC to 60 Hz telemetry system uses PAM and PCM systems. For a good quality data transmission, the minimum sampling rate must be

(A) 300 samples/sec
(B) 500 samples/sec
(C) 1500 samples/sec
(D) 1000 samples/sec

70. A system has poles at 0.01 Hz, 1 Hz and 80 Hz; zeros at 5 kHz, 100 Hz and 200 Hz. The approximate phase of the system response at 20 Hz

(A) –90° (B) 0°
(C) 90° (D) –180°

71. The 2-transform of $\left(\frac{1}{4}\right)^n u(-n)$ is

(A) $\frac{4z}{4z-1}$ $|z| > ¼$

(B) $\frac{4z}{4z-1}$ $|z| < ¼$

(C) $\frac{1}{1-4z}$ $|z| > ¼$

(D) $\frac{1}{1-4z}$ $|z| < ¼$

72. The z-transform of $\delta(n+k)$, $k > 0$ is

(A) $z^{-k}, z \neq 0$ (B) $z^{k}, z \neq 0$
(C) z^{-k}, a $\| z$ (D) z^{k}, a $\| z$

73. A PD controller is used to compensate the system. Compared to the uncompensated system, the compensated system has

(A) a higher type number
(B) a reduced dumping
(C) higher noise amplification
(D) larger transient overshoots

74. The value of $\int_{-\infty}^{\infty} \sin t \,.\, \delta(t - \pi/4) \,.\, dt$is

(A) $\sqrt{2}$ (B) $\frac{1}{\sqrt{3}}$
(C) $\frac{1}{\sqrt{2}}$ (D) $\sqrt{3}$

75. The minimum number of delay elements required realizing a digital filter with a transfer function

$$H(z) = \frac{1 + az^{-1} + bz^{-2}}{1 + cz^{-1} + dz^{-2} + ez^{-3}}$$

(A) 2 (B) 3
(C) 4 (D) 5

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