

098/23

Question Booklet Alpha Code

A

Question Booklet Sl. No.

Total Number of Questions : 100

Time : 90 Minutes

Maximum Marks : 100

INSTRUCTIONS TO CANDIDATES

1. The Question Paper will be given in the form of a Question Booklet. There will be four versions of Question Booklets with Question Booklet Alpha Code viz. **A, B, C & D**.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the Question Booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a Question Booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator **IMMEDIATELY**.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your Question Booklet is un-numbered, please get it replaced by new Question Booklet with same alpha code.
6. The Question Booklet will be sealed at the middle of the right margin. Candidate should not open the Question Booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the Question Booklet supplied to him/her contains all the 100 questions in serial order. The Question Booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the Question Booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices **(A), (B), (C)** and **(D)** having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

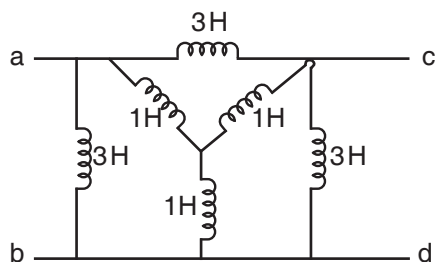
098/23

A

-2-

- How much time does a capacitor take to build up a charge with 10 mJ of energy, if the charging current of 100 mA taken by a 100 μF capacitor ?
 - 13.312 ms
 - 12.54 ms
 - 14.14 ms
 - 12.12 ms
- A resistance load being connected to a DC network, receives maximum power when the load resistance is equal to the internal resistance of the source network as seen from the load terminals.
 - Maximum power transfer theorem
 - Thevenin's theorem
 - Super position theorem
 - None of the above
- An LC circuit stores a total energy of E and the maximum charge on the capacitor is assumed as Q . What will be the energy stored in the inductor while the charge on the capacitor is $Q/2$?

A) $2E/3$	B) $E/3$
C) E	D) $3E/4$
- What will be the equivalent inductance seen between the terminal a-b for the given circuit ?



- | | |
|-----------|----------|
| A) 1.23 H | B) 1 H |
| C) 3.0 H | D) 1.5 H |

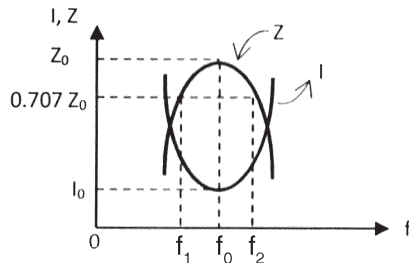
A

098/23

5. Average current value of a Sine wave is
- A) $0.707 I_{Peak}$
 - B) $0.636 I_{Peak}$
 - C) $1.33 I_{Peak}$
 - D) $1.414 I_{Peak}$
6. For a mutually coupled coils L1 and L2, the coefficient of coupling is given by the expression
- A) K only
 - B) $K \times L_1 \times L_2$
 - C) $K \times \sqrt{(L_1 \times L_2)}$
 - D) None of the above
7. The equation for EMF induced in a coil rotated in uniform magnetic field by an angle θ from its vertical position
- A) E_m
 - B) $E_m \cos \omega t$
 - C) $e \times \sin \omega t$
 - D) $E_m \sin \omega t$
8. The bandwidth of an RLC series circuit with resistance, inductance and capacitance of 10Ω , 0.1 H and $8 \mu\text{F}$ respectively is
- A) 15 Hz
 - B) 81 Hz
 - C) 1.8 Hz
 - D) 1 Hz
9. A circuit with RLC components, whose transient current is oscillatory when resistance is
- A) $R < 2\sqrt{(L / C)}$
 - B) $R > 2\sqrt{(L / C)}$
 - C) $R < \sqrt{(L / C)}$
 - D) $R = 0$

A

10. State the graph shown here correspond to which category



- A) Variation on impedance and current in a resistive circuit
 B) Variation on impedance and current in a parallel resonant circuit
 C) Variation on impedance and current in a series resonant circuit
 D) Variation on impedance and current in a capacitive circuit
11. As the temperature increases beyond the curie temperature, the relative susceptibility of ferromagnetic materials
- A) Increase
 B) Remains constant
 C) Becomes zero
 D) Decrease
12. If the area of hysteresis loop of a material is large, the hysteresis losses in the material will be
- A) Zero
 B) Large
 C) Small
 D) Unchanged
13. The total inductance of 2 coils connected in series cumulatively is 1.6 H and connected in differentially is 0.4 H. If the self inductance of one coil is 0.6 H then coupling coefficient will be
- A) 0.612
 B) 1.2
 C) 3
 D) 2.5
14. The induced emf in a magnetically linked coil when its flux is changed from 1 Wb to 0.1 Wb in 0.1 second is
- A) 1 V
 B) 0.09 V
 C) 0.9 V
 D) 9 V

A

098/23

15. The potential at a point due to a charge of $100 \mu\text{Coulomb}$ at a distance of 9 metres is
- A) 100 Volts
B) 10^5 Volts
C) 10^2 Volts
D) 1 Volt
16. A circular wire loop has its radius increasing at a rate of 6m/s . The loop is placed perpendicular to a constant magnetic field of 0.4 Wb/m^2 . When radius of the loop is 2m, the emf induced in the loop will be
- A) 4.8π Volts
B) 6π Volts
C) 8.8π Volts
D) 9.6π Volts
17. What will be the force experienced by the conductor when a current of 50 A flows through the conductor of length 0.5 m placed in a magnetic field of strength 0.5 wb/m^2 ?
- A) 12.5 N
B) 10.5 N
C) 1.5 kN
D) 0.5 N
18. A circuit carrying a triangular wave having a form factor
- A) Greater than 1.11
B) Less than 1.11
C) Equal to 1.11
D) Zero
19. The rms value of a half-rectified square wave below is



- A) 10.092 V
B) 7.071 V
C) 8.012 V
D) 5 V

A

20. The primary objective for making the coil span of a DC armature winding equal to a pole pitch is to
- A) Ensure the addition of emf of consecutive turns
 - B) Obtain a coil span of 180 degree electrical
 - C) Obtain a full pitch winding
 - D) Distribute the winding uniformly under different poles
21. The primary objective of commutating or reversing emf in DC machine is to
- A) Neutralize the reactance voltage
 - B) Neutralize the commutating resistance
 - C) Reduce heat production
 - D) Convert AC to DC
22. Under light load condition a series generator has rising voltage characteristics, but at a high loads the voltage starts decreasing due to
- A) Over heating of brushes
 - B) Low cross magnetising effect
 - C) Poor armature field resistance
 - D) Excessive demagnetising effects of armature reaction
23. A 250 V shunt motor with armature resistance of 0.5Ω runs at 600 rpm on full load and takes an armature current of 20 A. If resistance of 1.0Ω is placed in the armature circuit, then the speed at half-full load torque is
- A) 587.5 rpm
 - B) 600 rpm
 - C) 475.3 rpm
 - D) 1200 rpm
24. In a retardation test on a separately excited motor, the induced emf in the armature fall from 220 V to 190 V in 30 seconds on removing the armature from the supply. The same fall take place in 20 seconds if immediately after disconnection the armature is connected to a resistance which takes 10 A during this fall. Then the stray losses of the motor is
- A) 1950 W
 - B) 2750 W
 - C) 3500 W
 - D) 4100 W

098/23

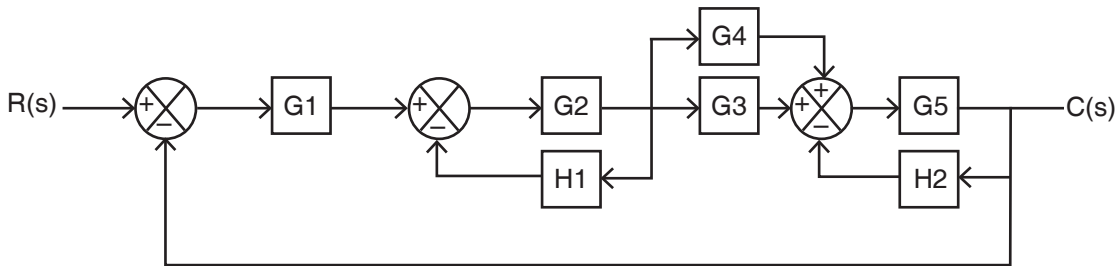
37. How many kilobytes of memory will be able to access a microprocessor with 12 bit address bus ?
A) 0.4 B) 2 C) 4 D) 10
38. A ring counter is same as
A) Shift counter
B) Parallel counter
C) Up-down counter
D) None of the above
39. A gate in which all inputs must be high to get a low output is called
A) NAND B) AND
C) NOR D) INVERTER
40. In 8085, TRAP is
A) always maskable
B) cannot interrupt a service subroutine
C) used for catastrophic events like temporary power failure
D) lowest priority interrupt
41. The _____ components consists of three vectors equal in magnitude and phase.
A) Positive sequence B) Negative sequence
C) Zero sequence D) None of the above
42. Inductance per phase of three phase transmission line is
A) $L = 2 \times 10^{-7} \ln \frac{D}{r^2} \text{H/km}$ B) $L = 2 \times 10^{-7} \ln \frac{D}{r} \text{H/km}$
C) $L = 4 \times 10^{-7} \ln \frac{D}{r'} \text{H/km}$ D) $L = 2 \times 10^{-7} \ln \frac{D}{r'} \text{H/km}$

43. If the voltage across each disc insulator in a string is equal then calculate the string efficiency.
- A) 0.75 B) 1 C) 0.5 D) 0.9
44. Which faults are very severe faults ?
- A) Line to ground fault
 B) Three phase fault
 C) Double line to ground fault
 D) Unsymmetrical fault
45. What are the various type of shunt faults ?
- A) Line to ground fault B) One open conductor fault
 C) Two open conductor fault D) None of the above
46. Generator emf is 1 p.u. and transient reactance is 25%. Find the transient current.
- A) $4 < 90^\circ$ B) $0.25 < -90^\circ$
 C) $5 < -90^\circ$ D) $4 < -90^\circ$
47. Give an expression for Swing Equation.
- A) $M \frac{d^2\delta}{dt^2} = P_m - P_e$ B) $M \frac{d^2\delta}{dt^2} = P_m - P_e$
 C) $M \frac{d^2\delta}{dt^2} = P_e - P_m$ D) None of the above
48. If the maximum power $P_{\max} = 50$ MW, find the electrical power output for a torque angle of 60°
- A) 43.3 MW B) 25 MW
 C) 32.5 MW D) 86.6 MW
49. In which bus real and reactive components of power are specified ?
- A) infinite bus B) load bus
 C) generator bus D) none of the above

098/23

50. In _____ method the convergence is not affected by the choice of slack bus.
- A) Gauss Siedal
 - B) Fast Decoupled
 - C) Newton Raphson
 - D) All of the above

51. Closed loop transfer function $\frac{C(s)}{R(s)}$ of the following system is



- A) $\frac{G1.G2.G3.G4 + G1.G2.G3.G5}{1 + G4.H2 + G2.G5.H1.H2 + G1.G2.G4.G5 + G1.G2}$
- B) $\frac{G1.G2.G3.G4}{1 + G1 + G2.H1 + G3.G4 + G5.H2}$
- C) $\frac{G1.G2.G4.G5 + G1.G2.G3.G5}{1 + G2.H1 + G5.H2 + G2.G5.H1.H2 + G1.G2.G4.G5 + G1.G2.G3.G5}$
- D) None of the above

52. The open loop transfer function with unity feedback is given by $G(s) = \frac{1}{S(S+2)}$, the poles of the closed loop system are located at

- A) (1, 1)
- B) (1, 0)
- C) (-1, -1)
- D) (0, -2)

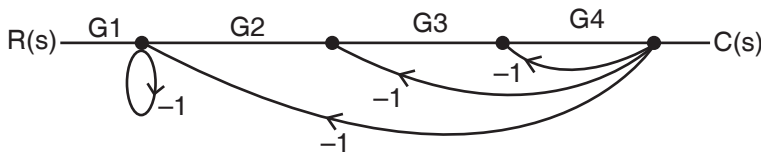
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53. Unit step response of 2nd order system is $1 - e^{-5t} - 5te^{-5t}$. Which of the following statements are correct ?

- i. Impulse response is $10e^{-5t}$.
- ii. Damping ratio is 1.
- iii. Undamped natural frequency is 5rad/sec.

- A) i, ii and iii
- B) ii and iii only
- C) ii only
- D) iii only

54. Closed loop transfer function $\frac{C(s)}{R(s)}$ of the following system is



- A) $\frac{G1.G2.G3.G4}{2 + 2.G4 + 2.G3.G4 + G2.G3.G4}$
- B) $\frac{G1.G2.G3.G4}{1 + G2.G3.G4}$
- C) $\frac{G1.G2.G3.G4}{2 + G1.G2 + G3.G4 + G1.G2.G3.G4}$
- D) $\frac{G1}{1 + G1.G2 + G2.G3 + G3.G4}$

55. Phase margin is the amount of angle to make the system

- A) Oscillatory
- B) Unstable
- C) Stable
- D) Exponential

098/23

56. The open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{3e^{-2s}}{s(s+2)}. \text{ The gain crossover frequency in rad/sec is}$$

- A) 0.69 B) 0.75 C) 1.26 D) 1.93

57. Range of 'k' for stability of the unity feedback system with open loop transfer function

$$G(s) = \frac{k}{s(s+1)(s+2)(s+5)} \text{ is}$$

- A) $18.32 < k < 25.61$
B) $1.09 < k < 5.32$
C) $11.96 < k < 15.39$
D) $0 < k < 19.69$

58. Consider the following systems

$$\text{System 1 : } \frac{1}{2s+1}$$

$$\text{System 2 : } \frac{1}{5s+1}$$

Which of the following statement is true ?

- A) Bandwidth of System 1 is greater than System 2
B) Bandwidth of System 1 is less than System 2
C) Bandwidth of System 1 is equal to System 2
D) Cannot be determined from the above data

59. Condition for stability of a closed loop system with characteristic equation $s^3 + bs^2 + cs + 1 = 0$ with positive coefficient is

- A) $b = c$
B) $b > c$
C) $b + c > 1$
D) $bc > 1$

A

60. Consider the following systems

$$\text{System 1 : } \frac{10}{s+1}$$

$$\text{System 2 : } \frac{10}{s+2}$$

Which of the following statement is true ?

- A) System 1 is faster than System 2
 B) System 1 is slower than System 2
 C) System 1 and System 2 have same speed
 D) Cannot be determined from the above data
61. An SCR is rated 450 V, 75 A. How many SCRs are required to be cascaded to form a circuit of 9 kV, 75 A rating ? Let the derating factor is 20%
- A) 20 B) 21 C) 25 D) 30
62. An half controlled single phase bridge rectifier in continuous load current mode is supplying an RL load operating at firing angle α . Fraction of cycle for which the free wheeling diode conduct is
- A) 0.5 B) $(1 - \alpha)/\pi$
 C) α D) α/π
63. A step-up chopper has an input voltage of 100 V and an output voltage of 250 V. The ON time of the chopper is 75 μ s. Time period of the chopper in μ s is
- A) 125 B) 75
 C) 105 D) 108
64. A three phase full bridge voltage source inverter delivers power to a star connected resistive load of 10 Ω /phase from a 450 V DC source. RMS value of load current per phase under 180° conduction mode will be
- A) 18.97 A B) 21.20 A C) 11.35 A D) 19.72 A

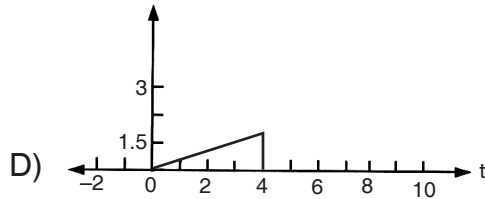
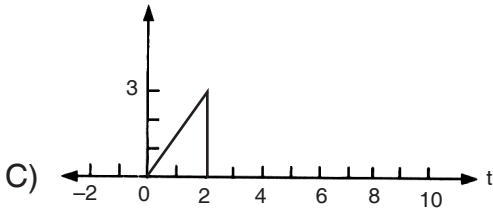
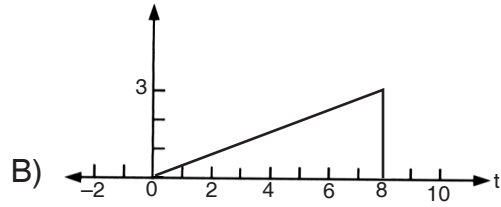
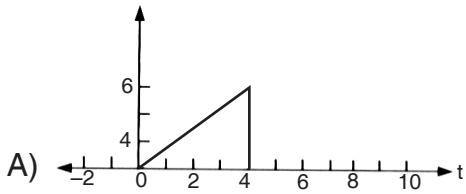
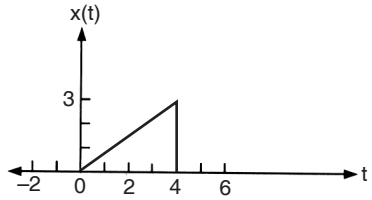
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098/23

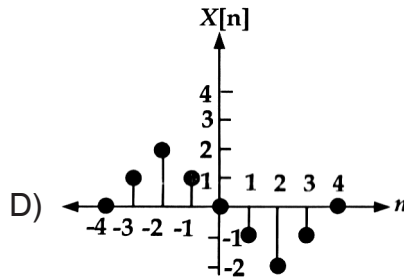
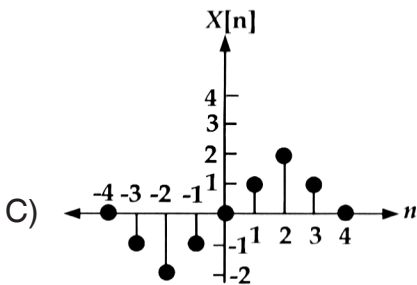
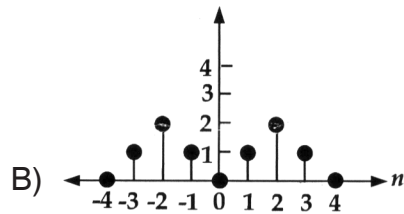
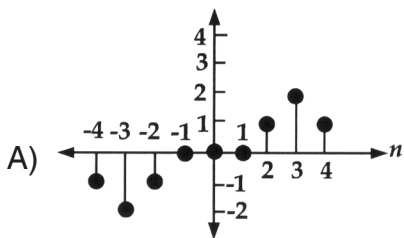
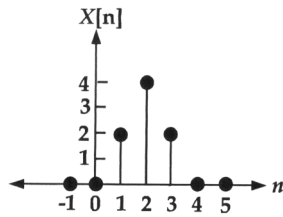
65. In a thyristor
- A) Holding current is more than Latching current
 - B) Holding current is less than Latching current
 - C) Holding current is equal to Latching current
 - D) Holding current is zero
66. An Op-Amp has an output signal of 2 V for an input of 50 mV. The voltage gain in dB is
- A) 12 dB
 - B) 32 dB
 - C) 19 dB
 - D) 25 dB
67. In response to a square wave input, the output of an Op-Amp changed from -3 V to $+3\text{ V}$ over a time interval of $0.25\ \mu\text{s}$. The slew rate in $\text{V}/\mu\text{s}$ of the Op-Amp will be
- A) 19
 - B) 20
 - C) 22
 - D) 24
68. In single pulse modulation of PWM inverter, 3rd harmonics can be eliminated if the pulse width is
- A) 30°
 - B) 60°
 - C) 90°
 - D) 120°
69. A step down chopper is operated in continuous conduction mode in steady state with a constant duty ratio 'D'. The relation between output voltage V_o and input voltage V_{in} , $\frac{V_o}{V_{in}} =$
- A) D
 - B) $1 - D$
 - C) $1/(1 - D)$
 - D) $D/(1 - D)$

A

81. A continuous time signal $x(t)$ is shown below $x(t/2)$ is



82. Odd component of given discrete time signal $X[n]$ is



A

098/23

90. Let $x(t) = 2u(t)$ and $y(t) = u(t)$, then $x(t) * y(t)$ is
A) $2u(t)$ B) $2e^{-t}u(t)$ C) $2tu(t)$ D) $2u(t^2)$
91. The table below show the combinations of signal conditioning circuits of the different types of transducers, out of these, the correct combinations are

Transducer	Signal conditioning circuit
P. Piezoelectric	Charge amplifier
Q. Strain gauge	Phase sensitive detector
R. Thermocouple	Cold junction compensation
S. L.V.D.T.	AC Bridge

- A) P, R and S B) R only C) P and R D) All are correct
92. A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 150 MN/m^2 . The modulus of elasticity of steel is 200 GN/m^2 . The change in the value of gauge resistance due to the applied stress will be
A) 0.15% B) 0.10% C) 0.05% D) 0.20%
93. A suitable value of a fixed resistance is usually connected across a thermistor is to
A) Increase the sensitivity B) Improve the linearity
C) Decrease its resistance D) Compensate its self-heating effect
94. Hall sensor is used to measure
A) Position of shaft B) Angular velocity
C) Strength of magnetic field D) All the above
95. The electrolyte of nickel-cadmium rechargeable cells is a mixture of
A) Potassium chloride and deionized water
B) Cadmium chloride and deionized water
C) Cadmium peroxide and deionized water
D) Potassium hydroxide and deionized water

A

Space for Rough Work

