# ELECTRICAL AND ELECTRONICS ENGINEERING

Time Allowed : 3 Hours ] [ Maximum Marks : 190

**DO NOT OPEN THE SEAL GIVEN ON THE RIGHT HAND SIDE UNLESS INSTRUCTED BY THE INVIGILATOR**

The Question Paper will contain 150 questions and will have 3 Sections as below :

| Section | | No. of Questions | Marks |
|---|---|---|---|
| (a) | Part A | 100 | 100 |
| (b) | Part B | 40 | 80 |
| (c) | Part C - General Knowledge (Common Part of all Subjects) | 10 | 10 |
| Total | | 150 Questions | 190 Marks |

## INSTRUCTIONS TO THE CANDIDATES

1. Read carefully and comply.
2. Fill the details including Name of the Candidate, Register Number, Question Paper Booklet Series in the OMR Answer Sheet. If you fail to fill the details and sign as instructed correctly, you will be personally responsible for the consequences arising during the scanning of your Answer Sheet.
3. All the 150 questions are of MCQ (Multiple Choice Questions) type. For each Question you will find 4 possible answers marked by the letters A, B, C and D. You are to select only one correct answer and mark in OMR Answer Sheet as per the instructions given therein. In any case, choose only one answer for each question. There will be no negative marking for wrong answers.
4. In the OMR Answer Sheet for each and every question shade only one answer. If more than one answers are shaded that question will be rejected for valuation.
5. Indicate your answer by darkening the appropriate circle as per the instructions given in the OMR Answer Sheet otherwise his/her Answer Sheet is liable to be rejected. For marking answers use Blue or Black Ball Point Pen only. Ensure that you darken only one circle. Darken it completely and don't overlap with any other circle.
6. Don't mark anything (including marking like ✓, ⊙, □) in the question paper booklet other than space provided for this purpose. If you fail to follow this, you will be disqualified.
7. In any event of any mistake in any Questions, candidates will not be penalized. However, no corrections will be made in Questions during the Examination.
8. Use of Mobile Phone, Pager, Digital Diary or any other Electronic Instrument etc., is not allowed. Their use will result in disqualification.
9. No candidate should leave the Examination Hall before the final bell. The OMR Answer Sheet should be handed over to the invigilator before leaving the Examination Hall. **The candidate is allowed to take the Question Booklet and Carbon copy of the OMR Answer Sheet with Him/ Her after the examination.**

1. In a string of suspension insulators, the voltage distribution across the different units of a string could be made uniform by the use of a grading ring, because it :
   (A) forms capacitances with link-pins to cancel the charging current from link-pins
   (B) forms capacitances which help to cancel the charging current from link-pins
   (C) increases the capacitances of lower insulator units to cause equal voltage drop
   (D) decreases the capacitance of upper insulator units to cause equal voltage drop

2. The insulation resistance of a single core cable is 200 $\mu\Omega$/km. The insulation resistance for 5 km length is :
   (A) 40 $\mu\Omega$ (B) 1000 $\mu\Omega$ (C) 200 $\mu\Omega$ (D) 8 $\mu\Omega$

3. Which one of the following statements is **not** correct for the use of bundled conductors in transmission lines ?
   (A) Control of voltage gradient
   (B) Reduction in corona loss
   (C) Reduction in radio interference
   (D) Increase in interference with communication lines

4. What is the energy supplied per year of a 100 MW power station if it delivers 100 MW for 2 hours, 50 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 45 days each year.
   (A) 160,000 MWh (B) 150,000 MWh (C) 155,000 MWh (D) 165,000 MWh

5. In load-flow analysis, the load at a bus is represented as :
   (A) a constant current drawn from the bus
   (B) constant impedance connected at the bus
   (C) a voltage-dependent impedance at the bus
   (D) a constant real and reactive powers drawn from the bus

6. What will be the holding current of SCR if its Latching Current is 25 mA ?
   (A) 30 mA (B) 50 mA (C) 25 mA (D) 10 mA

7. In chopper, if T is the chopping period, then output voltage can be controlled by PWM by varying :
   (A) T, keeping $T_{on}$ constant (B) T, keeping $T_{off}$ constant
   (C) $T_{on}$, keeping T constant (D) $T_{off}$, keeping $T_{on}$ constant

8. Turn-on time of SCR in series with RL circuit can be reduced by :
(A) Decreasing L (B) Increasing L (C) Decreasing R (D) Increasing R

9. When PN junction is forward biased ?
(A) the only current is hole current
(B) the only current is electron current
(C) the only current is produced by majority current
(D) the current is produced by both holes and electrons

10. In the reverse recovery characteristics of PN junction diode, the reverse recovery time is :
(A) Time taken by the minority carriers to recombine with opposite charges to be neutralised
(B) Time taken by the majority carriers to recombine with opposite charges to be neutralised
(C) Time taken by the movement of majority carriers only
(D) None of these

11. A simple slide wire is used for measurement of current in a circuit. The voltage drop across a standard resistor of 0.1Ω is balanced at 75cm. Find the magnitude of the current if the standard cell emf of 1.45 V is balanced at 50 cm :
(A) 21.75 A (B) 2.175 A (C) 0.2175 A (D) 9.667 A

12. The type of damping provided in electrodynamometer wattmeter is :
(A) Air friction damping (B) Eddy current damping
(C) Electromagnetic damping (D) None of the above

13. Two diametrically opposite holes are drilled in the disc of an energy meter to provide :
(A) over load compensation (B) temperature compensation
(C) prevention from creeping (D) friction compensation

14. A transducer has an output impedance of 1kΩ and a load resistance is 1MΩ, the transducer behaves as :
(A) a constant current source (B) a constant voltage source
(C) a constant power source (D) none of the above

15. Deflecting torque of a moving Iron instrument depends on :
(A) square of the current
(B) change in self inductance
(C) current and change in self inductance
(D) square of the current and change in self inductance

16. In a diode, during reverse biased condition, when the reverse voltage is increased, the increase in uncovered charge with applied voltage may be considered a capacitive effect. This capacitance is known as :

(A) space-charge capacitance (B) storage capacitance

(C) diffusion capacitance (D) diode capacitance

17. The type of feedback employed in source-follower circuit is :

(A) Voltage - Series feedback (B) Current - Series feedback

(C) Voltage - Shunt feedback (D) Current - Shunt feedback

18. In a Karnaugh map simplification, the octet eliminates :

(A) Three variables and their complements

(B) Two variables and their complements

(C) Eight variables

(D) All overlaping groups

19. In a JK Flip-flop, if the two inputs are high, then :

(A) The output will be complemented

(B) The output will be same as previous state

(C) The output will be set as '1'

(D) The output will be complemented by the clock pulse

20. The Control signals for Input/output in memory-mapped I/O of 8085 microprocessor are :

(A) $\overline{IOR}$ / $\overline{IOW}$ (B) IN/OUT

(C) $\overline{MEMR}$ / $\overline{MEMW}$ (D) STA, LDA

21. When a BJT is employed as an amplifier, it operates in _____ region.

(A) saturation (B) cut-off (C) active (D) ohmic

22. The best location for setting a Q-point (Quiescent point) on d.c. load line of an FET amplifier is at _____.

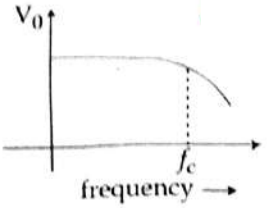
(A) saturation point (B) cut-off point (C) mid-point (D) ohmic region point

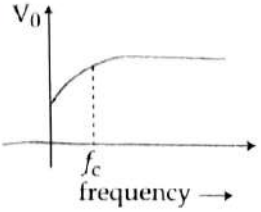
23. In a current-series feedback amplifier, the input resistance _____.

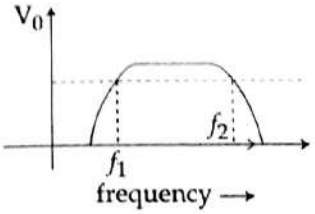
(A) increases (B) decreases

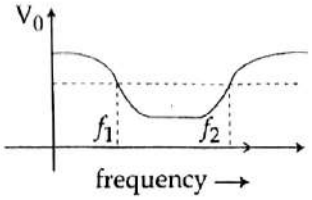
(C) remains unchanged (D) rapidly decreases

24. The frequency response of active low pass filter is :

(A) 


(B) 


(C) 


(D) 


25. _____ is a widely used, programmable, parallel I/O device.

(A) 8259 A programmable Interrupt Controller

(B) 8254 programmable Interval Timer

(C) 8255 A programmable Peripheral Interface

(D) 8237 DMA Controller

26. The Values of :

(i) $\sum_{n=0}^{\infty} \delta\,(n+1)\,e^{-2n}$

(ii) $u(n) - u(n-1)$

(A) Zero and $\delta(n)$

(B) Infinity and $\delta(-n)$

(C) $e^{-2}$ and $\delta(-n-1)$

(D) $e^{2}$ and $\delta(n)$

27. Consider the following frequency response for a causal and stable LTI system $H(jw) = \frac{1-jw}{1+jw}$ if $|H(jw)| = B$ then what is the value of B.

(A) 1

(B) 0

(C) $\infty$

(D) $-1$

28. What is the result of $u(n) - u(n-1)$ ?
(A) r(n) (B) $\delta(n)$ (C) u(n) (D) None

29. The fourier series of a periodic signal $x(t)$ with period T will not converge if :
(A) $|x(t)|$ is not finite at all values of t
(B) $x(t)$ has more than one maxima is one period T
(C) $x(t)$ is not continuous at all points
(D) $x(t)$ is not a band limited signal

30. The Laplace transform $x(s)$ of a real valued absolutely integrable signal $x(t)$ is know to have a pole at $S=2$ which of the following statements is true about $x(t)$ ?
(A) $x(t)$ is two sided but may be of finite duration
(B) $x(t)$ is two sided and of infinite duration
(C) $x(t)$ is right sided (causal)
(D) $x(t)$ is left sided (anti-causal)

31. A Mho relay is a :
(A) Voltage restrained directional relay
(B) Voltage controlled over current relay
(C) Directional restrained over current relay
(D) Directional restrained over voltage relay

32. Zero sequence current is exclusively used for relaying purposes only in the case of :
(A) phase over current relay (B) phase impedance relay
(C) ground over current relay (D) ground impedance relay

33. The rating of the coil of an electromagnetic relay is generally :
(A) 1 and 5 A (B) 5 and 10 A (C) 10 and 25 A (D) 50 and 100 A

34. Impulse ratios of insulators and lightning arresters should be :
(A) both low (B) high and low respectively
(C) low and high respectively (D) both high

35. Protection scheme used for detection of loss of excitation of a very large generating unit feeding power into a grid employs :
(A) Under voltage relay (B) Offset mho relay
(C) Under frequency relay (D) Percentage differential relay

36. Ripple factor of a diode rectifier is :

(A) $\frac{V_{dc}}{V_{ac}}$ (B) $\frac{V_{rms}}{V_{dc}}$ (C) $\frac{V_{ac}}{V_{dc}}$ (D) $\frac{V_{max}}{V_{rms}}$

37. The converter fed induction motor is controlled by :

(A) Stator voltage control

(B) Rotor voltage control

(C) Stator voltage and frequency control

(D) Any one of the above

38. Match **List - I** (SCR Rating) with **List - II** (Protective Element) and select the correct answer using the codes given below the lists :

| **List - I (SCR Rating)** | **List - II (Protective Element)** |
|---|---|
| (a) $\frac{dv}{dt}$ limit | (i) series reactor |
| (b) $\frac{di}{dt}$ limit | (ii) heat sink |
| (c) $i^2t$ limit | (iii) snubber |
| (d) Junction Temperature limit | (iv) HRC Fuse |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (i) | (iii) | (iv) | (ii) |
| (B) | (iii) | (i) | (iv) | (ii) |
| (C) | (iv) | (ii) | (i) | (iii) |
| (D) | (iv) | (ii) | (iii) | (i) |

39. In PWM method of controlling the average voltage in a DC-DC chopper may be varied by :

(a) ON time ($T_{on}$) of the switch is varied but the total time period is constant

(b) ON time of the switch ($T_{on}$) is kept constant and OFF time of the switch ($T_{off}$) is variable

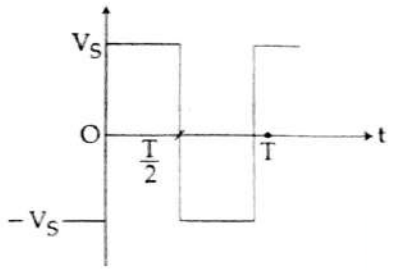
(c) OFF time of the switch ($T_{off}$) is kept constant and ON time of the switch ($T_{on}$) is variable

From the above the correct statements are :

(A) (a) and (b) only (B) (a) only

(C) (b) and (c) only (D) (a) and (c) only

40. The Second harmonic Component of the Waveform given in the following figure has an amplitude of :




(A) 0 (B) 1 (C) $\frac{2}{\pi}$ (D) 5

41. Standardization of potentiometer is done in order that, they become :

(A) accurate (B) precise

(C) accurate and direct reading (D) accurate and precise

42. A Metz price maximum demand indicator indicates :

(A) maximum demand

(B) average maximum demand over a specified period of time

(C) maximum energy consumption

(D) maximum power

43. The nominal ratio of the current transformer is :

(A) primary / secondary current (B) secondary / primary turns

(C) primary / secondary turns (D) rated primary/rated secondary current

44. Phantom loading for testing of energy meters is used :

(A) to isolate the current and potential circuits

(B) to reduce power loss during testing

(C) for meters having low current ratings

(D) large loads may not be available in the laboratory

45. The power in a 3$\phi$ circuit is measured with the help of two wattmeters. The readings of one the wattmeter is positive and the other is negative. The magnitude of readings are different. It can be concluded that the power factor of the circuit is :

(A) unity (B) zero lagging (C) 0.5 lag (D) less than 0.5 lag

46. The function $f(x) = \sin\left(\frac{1}{x}\right)$ cannot be expanded as a fourier in the interval $(-\pi, \pi)$ Since.

(A) $f(x) = \sin\left(\frac{1}{x}\right)$ has infinite number of maxima and minima near the line $x = 0$

(B) $f(x) = \sin\left(\frac{1}{x}\right)$ is not a periodic function

(C) $f(x) = \sin\left(\frac{1}{x}\right)$ has infinite number of discontinuites in the interval

(D) $f(x) = \sin\left(\frac{1}{x}\right)$ is unbounded

47. The Transformation of the differentiation $x^2y'' - xy' + y = \log x$ into a linear differential equation with constant coefficients by using $x = e^z$, $z = \log x$, $\theta = \frac{d}{dz}$ is :

(A) $(\theta - 1)^2 y = \log z$ (B) $(\theta + 1)^2 y = z$ (C) $(\theta - 1)^2 y = z$ (D) $\theta^2 y = z$

48. The Taylor series of $f(z) = \frac{1}{1+z^4}$, $0 < |z| < 1$ is :

(A) $f(z) = 1 + z^4 + z^8 + z^{12} + \ldots\ldots \infty$
(B) $f(z) = 1 - z^2 + z^4 - z^8 + \ldots\ldots \infty$
(C) $f(z) = 1 - z^4 + z^8 - z^{12} + \ldots\ldots \infty$
(D) $f(z) = 1 + z^2 + z^4 + z^8 + \ldots\ldots \infty$

49. If $L\{f(t)\} = F(s)$, then the initial value theorem for Laplace transform is :

(A) $\lim_{t \to 0} f(t) = \lim_{s \to \infty} F(s)$ (B) $\lim_{t \to \infty} f(t) = \lim_{s \to 0} F(s)$

(C) $\lim_{t \to 0} f(t) = \lim_{s \to \infty} sF(s)$ (D) $\lim_{t \to \infty} f(t) = \lim_{s \to 0} sF(s)$

50. The convolution between two functions $f(x)$ and $g(x)$ in the domain of fourier transform is :

(A) $f*g = \int_{-\infty}^{\infty} f(u)\, g(x-u)\, du$ (B) $f*g = \int_{-\infty}^{\infty} f(u)\, g(u)\, du$

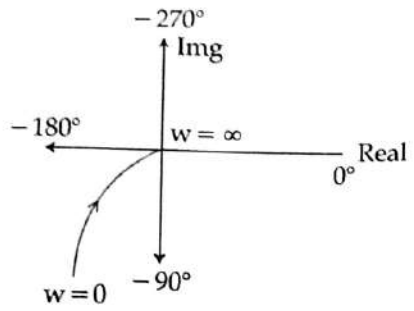
(C) $f*g = \int_{-\infty}^{\infty} f(u)\, g(x-u)\, dx$ (D) $f*g = \int_{-\infty}^{\infty} f(u)\, g(u)\, dx$

51. A pair of roots has been moved farther away from the imaginary axis then relative stability of the system will be :

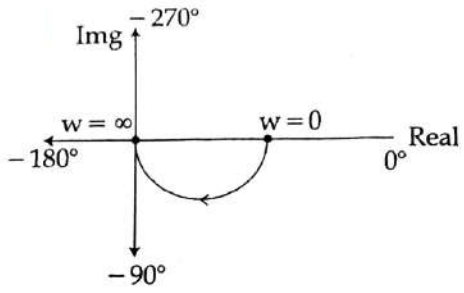
(A) Decreased (B) Infinity (C) Improved (D) Undefined

52. The Nyquist plot of a first order system $G(jw) = \frac{1}{1 + jwT}$ is :

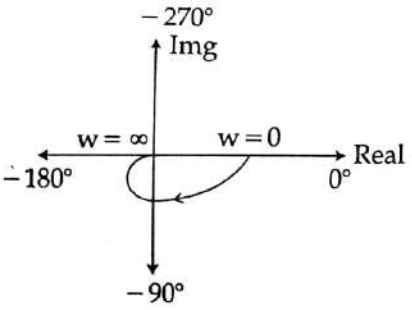
(A)



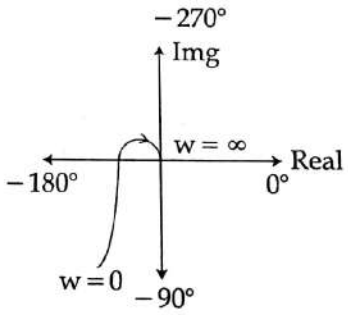

(B)




(C)




(D)




53. Select the wrong statement about the Negative feedback closed loop system :

(A) Better stability in steady state (B) Increases the error signal

(C) Rejects any disturbance signals (D) Low sensitivity to parameter variations

54. For the type 1, second order system, the value of peak overshoot $M_p$ is :

(A) $e^{-\frac{\varepsilon\pi}{\sqrt{1-\varepsilon^2}}}$ (B) $e^{-\frac{\pi}{\sqrt{1-\varepsilon^2}}}$ (C) $e^{-\frac{\varepsilon}{\sqrt{1-\varepsilon^2}}}$ (D) $e^{-\frac{\varepsilon^2\pi}{\sqrt{1-\varepsilon}}}$

55. For characteristic equation having more number of poles than zeros, the number of root locus branches will be equal to :

(A) number of zeros (B) number of poles

(C) sum of (A) and (B) above (D) difference of (B) and (A) above

56. In a $\Delta - \Delta$ connection, if one transformer becomes disabled, the capacity will be reduced to :

(A) 66.67% (B) 50% (C) 57.74% (D) 40%

57. In a dc motor, the mechanical output power actually comes from :

(A) field system (B) air-gap flex

(C) back emf (D) electrical input power

58. In a double revolving field theory of single phase induction motor, if the slip of the forward motor is 'S', then the slip of backward motor is :

(A) 2S (B) S (C) $2 - S$ (D) $S - 2$

59. Capacitor-start capacitor-run induction motor is basically a :

(A) AC series motor (B) Two-Phase motor

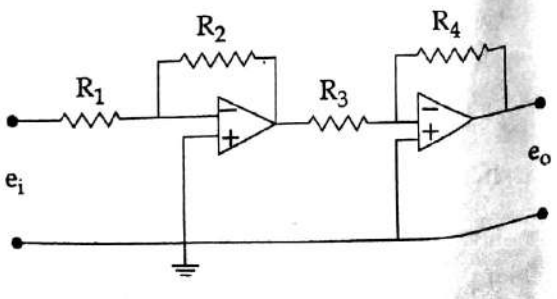
(C) Synchronous motor (D) Commutator

60. Synchronous impedance method of calculating voltage regulation of an alternator is otherwise called as :

(A) MMF method (B) Potier method

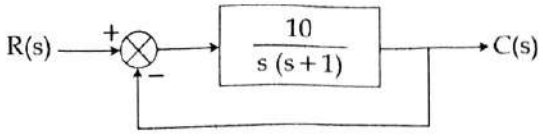
(C) EMF method (D) Zero power factor method

61. The transfer function of the operational amplifier circuit shown in figure is _____.




(A) $\frac{R_2R_4}{R_1R_3}$ (B) $\frac{R_1R_2}{R_3R_4}$ (C) $\frac{R_4R_3}{R_1R_2}$ (D) $\frac{R_1R_3}{R_2R_4}$

62. The system is represented by the block diagram shown in figure below :




The nature of response is :

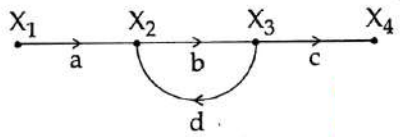
(A) Under damped (B) Critically damped

(C) Over damped (D) Undamped

63. The transfer functions are given below. Which one represents a non-minimum phase transfer function ?

(A) $\frac{s+1}{10\,(s+3)}$ (B) $\frac{(s+3)(s+4)}{s(s+1)(s+2)}$ (C) $\frac{s+4}{s^2(s+3)}$ (D) $\frac{s-1}{(s+2)(s+4)}$

64. The total gain $\frac{X_4}{X_1}$ of the signal flow graph shown in figure is _____.




(A) $\frac{abcd}{1-bd}$ (B) $\frac{abc}{1+bd}$ (C) $\frac{abc}{1-bd}$ (D) $\frac{abc}{d}$

65. The steady state error of Type-1 system for unit step input signal is equal to :

(A) $\infty$ (B) 1 (C) $-1$ (D) 0

66. If A is a $3\times3$ matrix with det (A) = 5 and if $B=4A^2$, then det (B) is equal to :

(A) 100 (B) 20 (C) 1600 (D) 320

67. A is a $3\times3$ matrix with eigen values $-1, 1, 0$. Then the determinant of $I+A^{100}$ is :

(A) 6 (B) 4 (C) 9 (D) 100

68. The function $f(x)=10+x^6$ :

(A) is a decreasing function of $x$

(B) has a minimum at $x=0$

(C) has neither a maximum nor a minimum at $x=0$

(D) none of these

69. If $u = \frac{x^2 y^2}{x^2 + y^2} \log\left(\frac{y}{x}\right)$, $v = \cos^{-1}\left(\frac{xy}{x^2 - y^2}\right)$ and if $z = u + v$ then $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y}$ equals to :

(A) $4v$ (B) $4u$ (C) $2u$ (D) $4u + v$

70. The function $f(z) = |z|^2$ is :

(A) differentiable everywhere (B) differentiable only at the origin

(C) not differentiable anywhere (D) differentiable on real $x$-axis

71. Which expression correctly represents the IDMT relay characteristics ?

(A) TMS (0.41) / $(PSM^{1.02} - 1)$ (B) TMS (1.4) / $(PSM^{0.02} - 1)$

(C) TMS (0.14) / $(PSM^{0.02} - 1)$ (D) TMS (14.0) / $(PSM^{2.0} - 1)$

72. The number of relaying input quantities and the number of settings for an over-current relay are :

(A) one input, two settings (B) two inputs, one setting

(C) one input, one setting (D) two inputs, two settings

73. The slope of percentage biased relay characteristics is proportional to :

(A) $N_r/N_o$ (B) $N_o/N_r$

(C) $(N_r + N_o)/(N_r - N_o)$ (D) $(N_r - N_o)/(N_r + N_o)$

74. The Component used in the output circuit of a static relay is :

(A) opamp (B) comparator (C) capacitor (D) thyristor

75. Effect of HVDC transmission in power system :

(A) improves voltage stability (B) causes voltage collapse

(C) has no effect (D) none of the above

76. Two wattmeters, which are connected to measure the total power on a three phase system, supplying a balance load, read 10.5 kW and $-2.5$ kW respectively. The total power and power factor are given by :

(A) 13 kW, 0.334 (B) 8 kW, 0.334 (C) 13 kW, 0.684 (D) 8 kW, 0.52

77. In an ACB phase sequence, if $V_{AN} = 230\angle -20°$, then $V_{CN}$ is given by :

(A) $230\angle -140°$ (B) $230\angle 100°$ (C) $230\angle -50°$ (D) $230\angle 10°$

78. The workdone in bringing a charge of $10 \times 10^{-4}\mu C$ from infinity to a point 25cm from a charge of $3.0 \times 10^{-2}\mu C$, is given by :

(A) $8.79 \times 10^{-7}$ J (B) $1.079 \times 10^{-7}$ J (C) $10.79 \times 10^{-7}$ J (D) $6.96 \times 10^{-7}$ J

79. According to Gauss's Law the surface integral of the normal component of electric flux density D over a closed surface containing charge Q is :

(A) $\frac{Q}{\varepsilon_0}$ (B) $\varepsilon_0 Q$ (C) Q (D) $\frac{Q^2}{\varepsilon_0}$

80. Consider the following statements which represents the force of point charges $Q_1 = 1nC$ and $Q_2 = 2nC$ at a distance apart.

(a) the force on $Q_1$ is repulsive

(b) as the distance between them decreases, the force on $Q_1$ increases linearly

(c) the force on $Q_2$ is the same in magnitude as that on $Q_1$

(d) a point charge $Q_3 = -3nC$ located at the mid point between $Q_1$ and $Q_2$ experiences no net force.

Of these statements which of the following are **incorrect** ?

(A) (a) and (d) (B) (b) and (c) (C) (b) and (d) (D) (c) and (d)

81. Consider the following statements, with reference to the dot convention in a magnetic circuit :

(a) If a current enters the dotted terminal of one coil, the reference polarity of the mutual voltage in the second coil is positive at the dotted terminal of the second coil.

(b) If a current enters the dotted terminal of one coil, the reference polarity of the mutual voltage in the second coil is negative at the dotted terminal of the second coil.

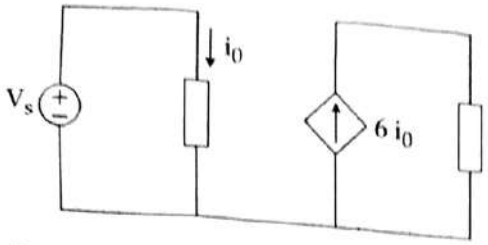
(c) If a current leaves in the dotted terminal of one coil, the reference polarity of mutual voltage in the second coil is positive at the dotted terminal of the second coil.

(d) If a current leaves in the dotted terminal of one coil, the reference polarity of the mutual voltage in the second coil is negative at the dotted terminal of the second coil. of these statements.

(A) (a) and (c) are correct (B) (a) and (d) are correct

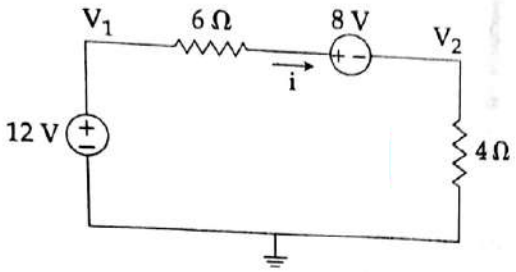
(C) (b) and (c) are correct (D) (b) and (d) are correct

82. The dependent source shown in the circuit below is :




(A) Voltage controlled current source
(B) Voltage controlled voltage source
(C) Current controlled voltage source
(D) Current controlled current source

83. For the circuit shown below, $V_1$ and $V_2$ are related as :




(A) $V_1 = 6i + 8 + V_2$
(B) $V_1 = 6i - 8 + V_2$
(C) $V_1 = -6i + 8 + V_2$
(D) $V_1 = -6i - 8 + V_2$

84. Consider the following statements with reference to parallel resonance :

(a) When $f < f_r$, inductive susceptance predominates. The current lags behind voltage and the power factor is lagging in nature.

(b) When $f = f_r$, net susceptance is zero. The admittance is minimum and impedance is maximum. At $f_r$ the current is in phase with the voltage and power factor is unity.

(c) When $f > f_r$, capacitive susceptance predominates. The current lags the voltage and power factor is lagging in nature.

(d) When $f > f_r$, capacitive susceptance predominates. The current leads the voltage and power is leading in nature.

Of these Statements :

(A) (a) and (c) are correct
(B) (b) and (d) are correct
(C) (a), (b) and (d) are correct
(D) (b), (c) and (d) are correct

85. Two 12-V batteries are being charged from a 16-V generator. The internal resistances are 0.5 Ω and 0.8 Ω for the batteries and 2 Ω for the generator. The currents flowing into the positive battery terminals are :

(A) 3.0 A and 1.6 A
(B) 2.3 A and 1.7 A
(C) 1.5 A and 0.5 A
(D) 1.07 A and 0.667 A

86. A transformer has negligible resistance and a p.u reactance of 0.1. Its voltage regulation on full load with a p.f angle of 30° leading is :

(A) 5%
(B) −5%
(C) 10%
(D) −10%

87. In an electromagnetic relay force acts in a direction :

(A) to maximize reluctance and maximize coil inductance
(B) to maximize reluctance and minimize coil inductance
(C) to minimize reluctance and minimize coil inductance
(D) to minimize reluctance and maximize coil inductance

88. The maximum regulation of a transformer occurs at a power factor of :

(A) Unity
(B) $\frac{X_{02}}{R_{02}}$ lead
(C) $\frac{R_{02}}{X_{02}}$ lead
(D) $\frac{X_{02}}{R_{02}}$ lag

89. If '$R_2$' be the standstill rotor resistance of an induction motor running at a slip 's', the mechanical load equivalent to an electrical resistance '$R_L$' in a stationary equivalent circuit is. equal to :

(A) $\frac{R_2}{s}$
(B) $\frac{R_2(1-s)}{s}$
(C) $\frac{R_2}{s^2}$
(D) $\frac{R_2(1-s)}{s^2}$

90. Armature reaction in an alternator primarily affects :

(A) rotor speed
(B) terminal voltage per phase
(C) frequency of armature current
(D) generated voltage per phase

91. In a two plant system, the load is connected to plant no. 2. The loss coefficients :

(A) $B_{11}$ and $B_{12}$ are non zero but $B_{22}$ is zero
(B) $B_{11}$, $B_{12}$, $B_{22}$ are non zero
(C) $B_{11}$ is non zero but $B_{12}$ and $B_{22}$ are zero
(D) $B_{11}$ and $B_{22}$ are nonzero but $B_{12}$ is zero

92. Which fault is more frequently occurring in power system ?
(A) Line to line fault
(B) Double line to ground fault
(C) Single line to ground fault
(D) Symmetrical 3 phase fault

93. In a string of suspension insulators, if potential across each disc is same then its string efficiency is :
(A) 50 %
(B) 100 %
(C) Less than 100%
(D) More than 100%

94. If the size of the conductor is increased then the corona effect is :
(A) Increased
(B) Decreased
(C) No change
(D) No corona is formed

95. Short circuit analysis is done in digital computer using :
(A) $Z_{bus}$
(B) $Y_{bus}$
(C) Any of the above
(D) None of the above

96. Noise is best example for :
(A) Digital signal
(B) Discrete signal
(C) Analog signal
(D) Random signal

97. Fourier transform of a discrete and aperiodic sequence is :
(A) Continuous and aperiodic
(B) Continuous and periodic
(C) Discontinuous and periodic
(D) Discontinuous and aperiodic

98. Find the z-transform of causal sequence, $x(n) = \{1, 0, 3, -1, 2\}$ :
(A) $x(z) = 1 + 3z^{-2} - z^{-3} + 2z^{-4}$
(B) $x(z) = 1 + z^{-1} + 3z^{-2} - z^{-3} + 2z^{-4}$
(C) $x(z) = z^3 + z^2$
(D) $x(z) = z^{-1} + 3z^{-2} - z^{-3} + 2z^{-4}$

99. If the signal $x(n)$ is real and odd, then fourier series coefficient $C_K$ is :
(A) Real and even
(B) Real and odd
(C) Imaginary and odd
(D) Imaginary and even

100. Fourier transform of the signal $x(n) = u(n-k)$ is :
(A) $\frac{e^{jwk}}{1 - e^{jwk}}$
(B) $\frac{e^{-jwk}}{1 + e^{jwk}}$
(C) $\frac{e^{-jwk}}{1 - e^{jwk}}$
(D) $\frac{e^{jwk}}{1 + e^{jwk}}$

101. A feedback system with the characteristic equation as $1 + K \cdot \frac{1}{S(S+1)(S+2)} = 0$

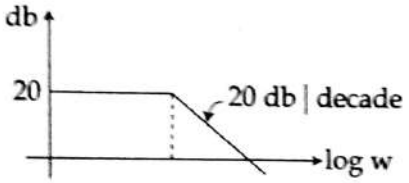
Which one is the actual break away point of root locus of the system.

(A) $S = -1.577$ (B) $S = -0.423$ (C) $S = -0.8$ (D) $S = -0.33$

102. If the unit step response of a network is $(1 - e^{at})$, then its unit impulse response will be :

(A) $a\, e^{-at}$ (B) $ae^{-1/a}$ (C) $\frac{1}{a\, e^{-at}}$ (D) $(1-a)\, e^{-at}$

103. Bode plot of a stable system is shown in the figure. The transfer function of the system is :




(A) $G(s) = \frac{100}{S + 10}$ (B) $G(s) = \frac{10}{S + 10}$

(C) $G(s) = \frac{1}{S + 10}$ (D) $G(s) = \frac{S}{S + 10}$

104. If an energy meter disc makes 10 revolutions in 100 seconds when a load of 450 W is connect to it, the meter constant (in rev/kWh ) is :

(A) 1000 (B) 5000 (C) 1600 (D) 800

105. Sensitivity of a potentiometer is :

(A) high for high value of potentiometer resistance

(B) low for high value of potentiometer resistance

(C) high for low value of potentiometer resistance

(D) constant with respect to potentiometer resistance

106. The z-transform and Region of Convergence (ROC) of the system $x(n) = \left(\frac{1}{3}\right)^n u(-n-1)$ is :

(A) $\frac{1}{1-\frac{1}{3}z^{-1}}$ ; $|z| < \frac{1}{3}$ (B) $\frac{-1}{1-\frac{1}{3}z^{-1}}$ ; $|z| < \frac{1}{3}$

(C) $1-\frac{1}{3}z^{-1}$ ; $|z| < \frac{1}{3}$ (D) $1+\frac{1}{3}z^{-1}$ ; $|z| > \frac{1}{3}$

107. The result of addition of two floating point numbers 3.0 and 0.125 is :

(A) $2^{010} \times 0.110010$ (B) $2^{100} \times 0.110010$ (C) $2^{001} \times 0.110010$ (D) $2^{001} \times 0.111100$

108. A shunt generator delivers 450 Amps at 230 Volt and the resistance of the shunt field and armature are 50 Ω and 0.03Ω respectively. The value of armature voltage drop will be :

(A) 100 volts (B) 22.500 volts (C) 13.6 volts (D) 13.5 volts

109. A 400/200 V transformer has p.u. impedance of 0.05. The HV side voltage required to circulate full load current during short circuit test is :

(A) 40 V (B) 20 V (C) 10 V (D) 5 V

110. The Power input to an induction motor is 40 kW when it is running at 5% slip. The stator resistance and core loss are assumed negligible. The mechanical power developed :

(A) 42 kW (B) 40 kW (C) 38 kW (D) 2 kW

111. Plug setting = 1.5 A, I relay = 9.0 A, for an OC relay. The PSM will be :

(A) 13.5 (B) 0.16 (C) 1.35 (D) 6.0

112. For stable operation, the normal value of 'δ' normally lies between :

(A) 0 to 30° (B) 0 to 90° (C) 0 to 60° (D) 0 to 180°

113. For rural electrification in a country like India with complex network it is preferable to use :

(A) Air break C. B. (B) Oil C. B. (C) Vaccum C. B. (D) M. O. C. B.

**114.** Match **List I** with **List II** and select the correct answer using the codes given below the lists

| List I | List II |
|---|---|
| (a) Thyrite arrester | (i) Tower location |
| (b) Sag template | (ii) Cross bonding |
| (c) Cable sheaths | (iii) Restriking voltage |
| (d) Circuit breaker | (iv) Non - linear resistor |

**Codes :**

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | (iv) | (i) | (iii) | (ii) |
| (B) | (iv) | (i) | (ii) | (iii) |
| (C) | (i) | (iv) | (iii) | (ii) |
| (D) | (iv) | (iii) | (i) | (ii) |

**115.** Given, damping ratio = 0.6 and undamped natural frequency = 5 rad/ sec, of the system. The peak time (tp) of the system is _____, when subjected to a unit step input.

(A) 0.25 sec (B) 0.785 sec (C) 0.6 sec (D) 1.27 sec

**116.** The torque exerted by the rotor magnetic field of a PM stepping motor with unexcited stator is called _____ torque.

(A) reluctance (B) detent (C) holding (D) either (B) or (C)

**117.** If, in a short transmission line, resistance and inductive reactance, are found to be equal and regulation appears to be Zero, then the load will :

(A) have unity power factor (B) have zero power factor

(C) be 0.707 leading power factor (D) be 0.707 lagging power factor

**118.** The p.u. impedance value of an alternator corresponding to base values 13.2kV and 30 MVA is 0.2 p.u. The p.u. Value for the base values 13.8 kV and 50 MVA will be :

(A) 0.306 p.u (B) 0.33 p.u (C) 0.318 p.u (D) 0.328 p.u

**119.** An alternator is supplying a load of 300kW at 0.6 p.f. lagging. If the power factor is raised to unity, how many more kilowatts can alternator supply for the same kVA loading ?

(A) 100 kW (B) 50 kW (C) 200 kW (D) 250 kW

120. The per unit values of positive, nagative and zero sequence reactances of a network at fault are 0.08, 0.07 and 0.05. What is the fault current if the fault is double line - to - ground.

(A) j 16 p.u (B) j 5 p.u (C) j 0.21 p.u (D) j 10 p.u

121. The value of $\int_0^1 x\,(1-x)^{10}\,dx$ is :

(A) $\frac{2}{132}$ (B) $-\frac{1}{132}$ (C) $\frac{1}{132}$ (D) 0

122. If S is a closed surface enclosing a volume V and $\vec{F} = 3\vec{i} + 2\vec{j} + \vec{k}$ and $\vec{n}$ is a unit outward drawn normal vector then :

(A) $\iint_S \vec{F}.\vec{n}\,dS = 3V$ (B) $\iint_S \vec{F}.\vec{n}\,dS = 2V$

(C) $\iint_S \vec{F}.\vec{n}\,dS = 6V$ (D) $\iint_S \vec{F}.\vec{n}\,dS = V$

123. The value of $I = \int_C f(z)\,dz$ where $f(z) = z^n$, C is a unit circle centred at the origin is :

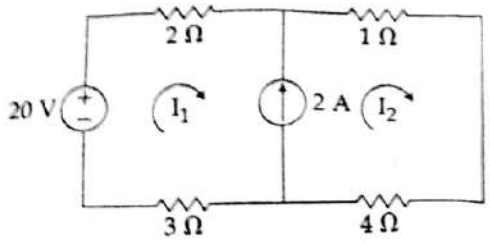
(A) $I = \begin{cases} 0, & n = -1 \\ 2\pi i, & n \neq -1 \end{cases}$ (B) $I = \begin{cases} 0, & n \neq -1 \\ 2\pi i, & n = -1 \end{cases}$

(C) $I = \begin{cases} 0, & n \neq -2 \\ \pi i, & n = -2 \end{cases}$ (D) $I = \begin{cases} \pi i, & n = -2 \\ 0, & n \neq -2 \end{cases}$

124. The value of $y$ at $x = 0.1$ for given $y' = x + y$, $y(0) = 1$, using Euler method is :

(A) 1.11 (B) 1.10 (C) 1.01 (D) 1

125. In the circuit in figure, the current $I_1$ is :




(A) 2A (B) 1A (C) 3A (D) 4A

126. How many flip - flops are required to construct a mod 128 counter ? What is the largest decimal number that can be stored in a mod - 64 counter ?

(A) 7 flip - flops, 127 (B) 7 flip - flops, 63

(C) 8 flip flops, 128 (D) 8 flip flops, 64

127. The SCR is rated at 75 A peak and 20 A average. The greatest possible delay in the triggering angle of SCR is :

(A) 47.5° (B) 75.5° (C) 30° and 45° (D) 137°

128. The input voltage of step - down chopper is 220 V, out put voltage is 150 V and chopping frequency is 4000 Hz. Find the $T_{on}$.

(A) 170 μs (B) 340 μs (C) 4 μs (D) 0.25 ms

129. An SCR is used for converting a.c. to d.c. The anode supply is 220V, 50 Hz and the firing angle is adjusted to 60°. The dc output voltage is :

(A) 74.2 V (B) 311 V (C) 220 V (D) None of these

130. In an uniform PWM (multi pulse width ) inverter, if P is the number of pulse per half cycle and δ is the duration of each pulse, then the rms output voltage equal to :

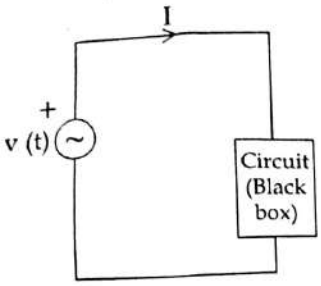
(A) $V_{rms} = V\sqrt{\frac{P\delta}{\pi}}$ (B) $V_{rms} = V\sqrt{\frac{\pi}{P\delta}}$

(C) $V_{rms} = PV\sqrt{\frac{\delta}{\pi}}$ (D) $V_{rms} = PV\sqrt{\frac{\pi}{\delta}}$

131. If $\overline{\nabla} \cdot \overline{D} = \Sigma \overline{\nabla} \cdot \overline{E}$ and $\overline{\nabla} \cdot \overline{J} = \sigma \overline{\nabla} \cdot \overline{E}$ in a given material, then the material is said to be :

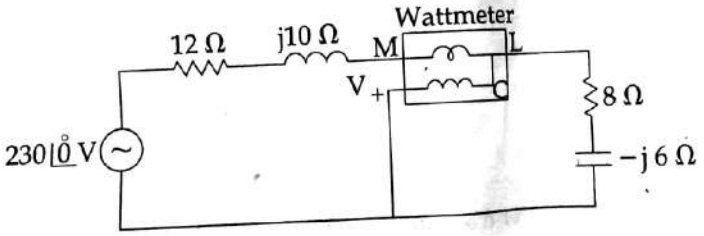
(A) Linear
(B) Homogenous
(C) Isotropic
(D) Linear and Homogenous

132. For the circuit given below in the black box if $v(t) = 160 \sin(\omega t + 10^\circ)$ and $I(t) = 5 \sin(\omega t - 20^\circ)$ then the reactive power and active power absorbed by black box respectively is :




(A) 346.4 Var, 200 W
(B) 136.8 Var, 375.9 W
(C) 200 Var, 346.4 W
(D) 375.9 Var, 136.8 W

133. The wattmeter reading of the circuit shown below is :




(A) 628.5 W
(B) 1482.7 W
(C) 1017.3 W
(D) 762.9 W

134. What is the discrete time signal obtained after sampling of the analog signal, $x_a(t) = 3 \cos 100\pi t$. Assume that the signal is sampled at the rate of $F_s = 75$ Hz.

(A) $3 \cos \frac{4\pi}{3} n$
(B) $3 \cos \frac{2\pi}{3} n$
(C) $3 \cos \frac{\pi}{3} n$
(D) $3 \cos \pi n$

135. The system $y(n) = \log_{10}|x(n)|$ is :

(A) Causal and Time variant
(B) Causal and Time invariant
(C) Non causal and Time variant
(D) Non causal and Time invariant

136. When measuring power with an electrodynamometer wattmeter in a circuit having a low power factor :

(A) the current coil should be connected on the load side

(B) the current coil should be connected on the supply side

(C) the pressure coil should be connected on the load side

(D) a compensated wattmeter with pressure coil connected on the load side should be used

137. While finding insulation resistance by loss of charge method, the voltage at the capacitor at any instant t after the application of voltage is :

(A) $v = V \exp(-t/Rc)$ (B) $V = v \exp(-t/Rc)$

(C) $v = V(1 - \exp(-t/Rc))$ (D) $V = v(1 - \exp(-t/Rc))$

Where V - source voltage

$v$ - voltage at any instant

138. What is the value of drain current of a JFET at $V_{as} = -4$ Volts. Take saturation drain current of 20 mA and pinch - off voltage of $-8$ Volts.

(A) 20 mA (B) 8 mA (C) 10 mA (D) 5 mA

139. The expression for time period of a 555 Timer based astable multivibrator is :

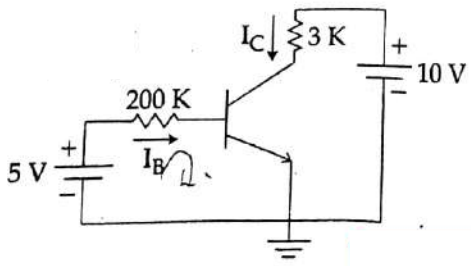
(A) $t_1 = 0.7 (R_1 + R_2) C_1$ and $t_2 = 0.7 R_2 C_1$

(B) $t_1 = (R_1 + R_2) C_1$ and $t_2 = 0.7 R_1 C_1$

(C) $t_1 = R_1 C_1$ and $t_2 = 0.7 R_2 C_1$

(D) $t_1 = 0.7 (R_1 + R_2) C_1$ and $t_2 = R_2 C_1$

140. Find the base current $I_B$ and the status of the transistor in the circuit shown in figure below assume $\beta = 100$.




(A) $I_B$ = 0.25 mA and cut off region (B) $I_B$ = 0.215 mA and saturation region

(C) $I_B$ = 2.15 mA and active region (D) $I_B$ = 0.0215 mA and active region

141. Consider the following rivers :

(a) Narmada (b) Brahmaputra

(c) Godavari (d) Tapti

Which of the above is/are flowing into the Bay of Bengal ?

(A) (a), (b) and (c) only (B) (b) and (c) only

(C) (a) and (b) only (D) (a) and (c) only

142. Article 21-A and the RTE Act came into effect :

(A) On 1st April 2010 (B) On 1st April 2009

(C) On 1st April 2017 (D) On 1st April 2005

143. First state to fix minimum education qualification for cooperative body poll :

(A) Rajasthan (B) West Bengal (C) Tamil Nadu (D) Karnataka

144. In a class of 45 students, a boy is ranked 20th. When two boys joined, his rank was dropped by one. What is his new rank from the end ?

(A) 25th (B) 26th (C) 27th (D) 28th

145. In which of the following temple, the front Mandapam is in the form of a huge chariot drawn by horses ?

(A) Patteswaram temple

(B) Darasuram temple

(C) Thanjavur Brihadeeswarar temple

(D) Thiruvarur Thyagaraja temple

146. Who wrote the novel - 'KavalKottam' ?

(A) Vannadasan (B) S. Venkatesan (C) Joe D Cruz (D) Puviarasan

147. Quit India Movement was launched in response to :

(A) Cabinet Mission plan (B) Cripps proposals

(C) Simon Commission Report (D) Wavell plan

148. What temperature are Fahrenheit and Celsius equal ?

(A) $-40°$ (B) 574.59 (C) 40 (D) $-574.59$

149. Who won the gold both in the 5,000 and 10,000 metres event in 2017 Asian Athletics Championship ?

(A) Lakshmanan (B) Gopi Thonkanal

(C) Jinson Johnson (D) Neeraj Chopra

150. The parliament can make any law for whole or any part of India for implementing international treaties :

(A) with the consent of all the states

(B) with the consent of the majority of states

(C) with the consent of the states concerned

(D) without the consent of any state

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