TS PGECET 2026 Electrical Engineering (EE)

Question Paper

Conducted by JNTU, Hyderabad

General Instructions

(i) The test is of 2 hours duration.

(ii) This test paper consists of 120 questions. The maximum marks are 120.

(iii) Each question carries +1 marks for correct answer and there is no negative marking for wrong answer.

1. If $A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 5 & 4 \\ 1 & 0 & 5 \end{bmatrix}$**, then the determinant of** $\left(A^{2026} - 11A^{2025} - 9A^{2023}\right)$ **is equal to:**

(A) 9^{2026}

(B) $(-31)^3 3^{2025}$

(C) $(-31)^3 3^{4048}$

(D) $(31)^4 3^{4048}$

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2. An Eigen value of the matrix $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & 0 \\ 1 & 2 & 1 \end{bmatrix}$ **is 1. An eigen vector corresponding to it is:**

(A) $\begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}$

(B) $\begin{bmatrix} 4 \\ 2 \\ -1 \end{bmatrix}$

(C) $\begin{bmatrix} -4 \\ 2 \\ 1 \end{bmatrix}$

(D) $\begin{bmatrix} 3 \\ 0 \\ 1 \end{bmatrix}$

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3. If $z = x^2y + e^{xy^2}$, then $\left(\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y}\right)$ evaluated at $(1, 0)$ is:

(A) 0

(B) 1

(C) 2

(D) -2

---

4. If $f(x) = x^3$, $0 \le x \le 4$, $f(x+4) = f(x)\ \forall x \in \mathbb{R}$ and the Fourier series of $f(x)$ is $f(x) = \sum_{n=0}^{\infty}\left(a_n \cos\frac{n\pi x}{2} + b_n \sin\frac{n\pi x}{2}\right)$, then $a_0 =$

(A) 8

(B) 32

(C) 16

(D) 24

---

5. The particular integral of $\left(D^4 - D^3 - 9D^2 - 11D - 4\right)y = e^{-x}$, where $D = \frac{d}{dx}$, is:

(A) $-\frac{x^2e^{-x}}{20}$

(B) $-\frac{xe^{-x}}{15}$

(C) $-\frac{x^3e^{-x}}{30}$

(D) $-\frac{e^{-x}}{10}$

---

6. The solution of $\frac{\partial^2 z}{\partial x^2} + z = 0$, satisfying $z(0, y) = e^y$, $\left(\frac{\partial z}{\partial x}\right)_{x=0} = 1$ is $z(x, y) =$

(A) $e^y \sin x + \cos x$

(B) $\sin x + e^y e^x \cos x$

(C) $e^y \cos x + \sin x$

(D) $e^y \cos x + y \sin x$

7. Let $r = \text{Min}\{\alpha, \beta, \gamma\}$, $R = \text{Max}\{\alpha, \beta, \gamma\}$, $f(z) = \frac{z}{(z-\alpha)(z-\beta)(z-\gamma)}$. $I_1 = \oint_{C_1} f(z)dz$ and $I_2 = \oint_{C_2} f(z)dz$, where $C_1 : |z| < r$ and $C_2 : |z| = R+1$, then $I_1 + I_2 =$

(A) $2\pi i$

(B) 0

(C) πi

(D) $-\pi i$

---

8. The inverse Laplace transform of $\frac{s+3}{s^2-4s+13}$ is:

(A) $e^{2t}[\cos 2t + 3\sin 2t]$

(B) $\frac{e^{2t}}{3}[3\cos 3t + 5\sin 3t]$

(C) $e^{2t}[t + 3\sin 3t]$

(D) $\frac{e^{2t}}{5}[5\cos 3t + 3\sin 3t]$

---

9. Choose a possible probability density function from the given functions:

(A) $f(x) = \begin{cases} 1, & 0 \le x \le 2 \\ 0, & \text{otherwise} \end{cases}$

(B) $f(x) = \begin{cases} e^{-x}, & x \ge 0 \\ 0, & x < 0 \end{cases}$

(C) $f(x) = \begin{cases} \frac{6}{5}x(1+x), & x \ge 0 \\ 0, & x < 0 \end{cases}$

(D) $f(x) = \begin{cases} x(1-x), & 0 \le x \le 1 \\ 0, & \text{elsewhere} \end{cases}$

---

10. The iterative formula for finding the approximate root of $f(x) = 0$ using Newton-Raphson method is:

(A) $x_n = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$

(B) $x_n = x_{n+1} + hf(x_n, y_n)$

(C) $x_n = \frac{x_{n-1}+x_{n-2}}{f(x_{n-1})}$

(D) $x_n = \frac{x_{n-1}f(x_{n-2}) - x_{n-2}f(x_{n-1})}{f(x_{n-1}) - f(x_{n-2})}$

11. The work done by the force $\vec{F} = 4\hat{a}_x - 3\hat{a}_y + 2\hat{a}_z$ N in giving a 1 nC charge a displacement of $10\hat{a}_x + 2\hat{a}_y - 7\hat{a}_z$ m is:

(A) 103 nJ

(B) 20 nJ

(C) 64 nJ

(D) 60 nJ

---

12. The superposition theorem is essentially based on the concept of:

(A) duality

(B) reciprocity

(C) non-linearity

(D) linearity

---

13. When both the number of turns and the core length of an inductive coil are doubled, its self-inductance will be:

(A) halved

(B) unaffected

(C) quadrupled

(D) doubled

---

14. The magnetic susceptibility of diamagnetic materials is:

(A) Much more than zero

(B) Less than zero

(C) Equal to zero

(D) Infinite

---

15. Two thin parallel wires carry currents along the same direction. The force experienced by one due to the other is:

(A) Perpendicular to the lines and attractive

(B) Perpendicular to the lines and repulsive

(C) Zero

(D) Parallel to the lines

---

16. The surface integral of the normal component of electric flux density over any closed surface is equal to the following enclosed:

(A) current

(B) charge

(C) voltage

(D) capacitance

---

17. Identify the statement that is not true for ferromagnetic material

(1) They have large magnetic susceptibility

(2) They have a fixed value of relative permeability

(3) Energy loss is proportional to the area of the hysteresis loop

(4) Above curie temperature, they lose their non-linearity property

---

18. The dipole moment per unit volume is known as

(1) Dielectric constant

(2) Polarization

(3) Capacitance

(4) Permittivity

---

19. At resonance, voltage across L and C in series circuit is

(1) equal and opposite

(2) unity

(3) infinite

(4) zero

---

20. Choose the correct statement

(1) Capacitor behaves like a short circuit at very high frequency and inductor behaves like a short circuit at very low frequency

(2) Capacitor behaves like an open circuit at very high frequency and inductor behaves like a short circuit at very low frequency

(3) Capacitor behaves like a short circuit at very high frequency and inductor behaves like an open circuit at very low frequency

(4) Capacitor behaves like an open circuit at very high frequency and inductor behaves like an open circuit at very low frequency

---

21. If all resistances in delta are equal to 30 Ω, then each resistance in star is

(1) 30 Ω

(2) 90 Ω

(3) 10 Ω

(4) 900 Ω

---

22. Phasor analysis is valid for

(1) Transient signals

(2) Steady state sinusoidal signals

(3) both transient and steady state

(4) exponential signals

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23. Choose the correct statement

(1) The magnetic dipole moment is the sum of current and area of the loop, its direction is normal to the loop

(2) The magnetic dipole moment is the product of current and area of the loop, it has no direction

(3) The magnetic dipole moment is the product of current and area of the loop, its direction is normal to the loop

(4) The magnetic dipole moment is the sum of current and volume of the loop, its direction is normal to the loop

---

24. At resonance, power factor in a parallel RLC circuit is

(1) Unity

(2) Zero

(3) Infinite

(4) 0.5

---

25. Thevenin equivalent of a circuit consists of

(1) Current source and series resistance

(2) Voltage source and series capacitance

(3) Voltage source and series resistance

(4) Current source and parallel resistance

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26. The varying electric fields are a source of

(1) Displacement current

(2) Conduction current

(3) Convection current

(4) Both conduction and convection current

---

27. Form factor of a sine wave is

(1) 0.75

(2) 0.65

(3) 0.50

(4) 1.11

---

28. Internal resistance of ideal current source is

(1) Zero

(2) Infinity

(3) Unity

(4) 100

---

29. The efficiency of a circuit at maximum power transfer condition is

(1) 100%

(2) 50%

(3) 25%

(4) 75%

30. In a two wattmeter method, if one wattmeter reads negative then

(1) Power factor > 0.5

(2) Power factor $= 1$

(3) Power factor < 0.5

(4) Zero power factor

---

31. The copper and iron losses of a 1-ϕ transformer are equal at 90% of full load and its value is 162 W. The total loss at 80% of full load is

(1) 145 W

(2) 244 W

(3) 128 W

(4) 153 W

---

32. In an ideal transformer, which of the following is correct?

(1) $\left(\frac{V_1}{V_2}\right) = \left(\frac{I_1}{I_2}\right) = \left(\frac{N_1}{N_2}\right)$

(2) $\left(\frac{V_1}{V_2}\right) = \left(\frac{I_2}{I_1}\right) = \left(\frac{N_2}{N_1}\right)$

(3) $\left(\frac{V_1}{V_2}\right) = \left(\frac{I_2}{I_1}\right) = \left(\frac{N_1}{N_2}\right)$

(4) $\left(\frac{V_2}{V_1}\right) = \left(\frac{I_1}{I_2}\right) = \left(\frac{N_1}{N_2}\right)$

---

33. In delta-star connection, the phase displacement between the primary voltage and secondary emfs is

(1) 30°

(2) -60°

(3) 60°

(4) -30°

---

34. A transformer has full load copper loss of 400 W. The copper loss at half full load will be

(1) 400 W

(2) 200 W

(3) 100 W

(4) 50 W

35. The load current of a step down 250/200 V auto-transformer is 100 A. The conductive and inductive powers transformed are

(1) 4 kVA and 20 kVA

(2) 4 kVA and 16 kVA

(3) 16 kVA and 4 kVA

(4) 20 kVA and 4 kVA

---

36. The eddy current loss and hysteresis loss of 1-ϕ, 100 kVA, 50 Hz transformer are 4 kW and 6 kW respectively. If frequency is increased by 10%, then total loss is

(1) 11.44 kW

(2) 11.66 kW

(3) 11.00 kW

(4) 12.10 kW

---

37. In a wave winding, if y_b and y_c are back and commutator pitches respectively, then the front pitch y_f is given by

(1) $y_f = 2y_b + y_c$

(2) $y_f = 2y_c - y_b$

(3) $y_f = 2y_b - y_c$

(4) $y_f = y_b - 2y_c$

---

38. A DC generator with 8-pole, 480 armature conductors, wave winding, draws an armature current of 200 A. When brushes are shifted by 6° electrical from GNP, the cross-magnetising amp-turn/pole is

(1) 2200

(2) 200

(3) 800

(4) 2800

---

39. To control voltage of a long shunt dc compound generator, a diverter resistance is connected across

(1) shunt and series field windings

(2) series field winding

(3) shunt field winding

(4) series field and armature winding

---

40. When load current of a dc series motor is increased, then

(1) speed decreases non-linearly and torque increases non-linearly

(2) flux increases non-linearly and torque increases linearly

(3) speed decreases linearly and torque increases non-linearly

(4) speed decreases non-linearly and torque increases linearly

---

41. The disadvantage of Hopkinson's test on two dc shunt machines is

(1) copper and iron losses are assumed equal

(2) requires two unidentical machines

(3) iron and mechanical losses are assumed equal

(4) iron and mechanical losses are assumed unequal

---

42. Slope of the tangent drawn on initial portion of O.C.C of synchronous generator is

(1) Unsaturated synchronous resistance

(2) Saturated synchronous impedance

(3) Critical resistance

(4) Unsaturated synchronous impedance

---

43. If the locus of minimum armature currents of V-curves of synchronous motor is a straight line, then the slope of the line is

(1) positive

(2) negative

(3) zero

(4) infinite

---

44. If δ is load angle, the real power of 3-ϕ synchronous motor is

(1) directly proportional to δ

(2) directly proportional to $\sin\delta$

(3) inversely proportional to $\sin\delta$

(4) inversely proportional to δ

---

45. Speed of a 3-ϕ, 4-pole, 60 Hz induction motor at 75% of full-load is 1700 rpm. The speed at full-load can be

(1) 1750 rpm

(2) 1800 rpm

(3) 1700 rpm

(4) 1600 rpm

---

46. Frequency of rotor current of a 3-ϕ, 4-pole, 50 Hz induction motor is 3 Hz. Speed of the motor is

(1) 1425 rpm

(2) 1497 rpm

(3) 1455 rpm

(4) 1410 rpm

---

47. When the supply voltage to an induction motor is reduced by 10%, the maximum torque will be decreased approximately by

(1) 5%

(2) 10%

(3) 20%

(4) 40%

---

48. Two 3-ϕ induction motors with p_1 and p_2 poles are cascaded together. Then the possible number of speeds are

(1) two

(2) one

(3) four

(4) three

49. In torque-slip curve of a 1-ϕ induction motor, the backward torque is

(1) negative from slip s=0 to s=1 and positive from slip s=1 to s=2

(2) negative from slip s=0 to s=2

(3) negative from slip s=0.5 to s=1.5

(4) negative from slip s=1 to s=2 and positive from slip s=0 to s=1

---

50. The step angle of a 3-ϕ (A, B, C), 6 stator pole, 4 rotor teeth stepper motor if excited sequentially i.e, A, AB, B, BC, C, CA, and so on is:

(A) 3.75°

(B) 30°

(C) 15°

(D) 7.5°

---

51. What is the VA output required for a CT of 5 A rated secondary current when burden consists of a relay requiring 7.5 VA at 5 A and connecting lead resistance of 0.08 Ω?

(A) 7.5 VA

(B) 15.0 VA

(C) 9.5 VA

(D) 1.3 VA

---

52. In which relay, the relay operation depends upon the ratio of voltage to current?

(A) directional

(B) differential

(C) distance

(D) reverse

---

53. Resistance switching is used in circuit breaker to:

(A) decrease the restriking voltage and increase the severity of transient oscillations

(B) increase the severity of transient oscillations and the severity of transients

(C) Reduce the restriking voltage and severity of transient oscillations

(D) increase the restriking voltage and reducing the severity of transient oscillations

54. For an n^{th} order system to be state controllable, which of the following is not a correct statement?

(A) The controllability matrix must be of rank n

(B) The controllability matrix must contain n linearly independent column vectors

(C) The controllability matrix must contain n linearly dependent column vectors

(D) The determinant of controllability matrix is not singular

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55. A generating station has a maximum demand of 25 MW, a load factor of 60%, a plant capacity factor of 50%. What is the reserve capacity of the plant?

(A) 25 MW

(B) 15 MW

(C) 7.5 MW

(D) 5 MW

---

56. The current densities in human bodies lie in the proximity of the transmission line are:

(A) induced by electric fields are much lower than those induced by magnetic fields

(B) induced by electric fields only

(C) induced by electric fields are much higher than those induced by magnetic fields

(D) induced by magnetic field only

---

57. The characteristics of rate of convergence of Gauss-Seidel method and Newton-Raphson method respectively are

(A) linear, linear

(B) quadratic, quadratic

(C) quadratic, linear

(D) linear, quadratic

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58. In case of the compensation of the power transmission lines, for the same voltage boost, the reactive power capacity of a shunt capacitor is _____ that of a series capacitor.

(A) equal to

(B) greater than

(C) less than

(D) half of

---

59. Under steady state short circuit conditions, the armature reaction of a synchronous generator is:

(A) Cross-magnetizing

(B) Demagnetizing

(C) Magnetizing

(D) Partially cross-magnetizing

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60. A fully transposed transmission line has

(A) Zero sequence impedance larger than the positive sequence impedance

(B) Zero sequence impedance smaller than the positive sequence impedance

(C) Zero sequence impedance equal to positive sequence impedance

(D) Positive sequence impedance is larger than the negative sequence impedance

---

61. The swing equation of a synchronous generator is

(A) Linear, second order differential equation

(B) Non-linear, second order differential equation

(C) Non-linear, second order algebraic equation

(D) Non-linear, first order differential equation

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62. In nuclear reactors, the most commonly used neutron absorber is:

(A) Uranium

(B) Hydrogen

(C) Boron

(D) Oxygen

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63. The insulation resistance of a single core cable is 160 **MΩ/km. The insulation resistance for** 4 **km length is**

(A) 640 MΩ

(B) 160 MΩ

(C) 40 MΩ

(D) 80 MΩ

---

64. The insulators used in transmission lines at river and road crossing are:

(A) Strain type

(B) Suspension type

(C) Pin type

(D) Cup type

---

65. The effect of increase in temperature on transmission lines:

(A) Sag and tension of conductor decreases

(B) Sag and tension of conductor increases

(C) Sag increases and tension of the conductor decreases

(D) Sag decreases and tension of the conductor increases

---

66. In distribution systems, the size of conductor is determined by using:

(A) Faraday's law

(B) Kelvin's law

(C) Ohm's law

(D) Kirchhoff's law

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67. Bonding of the cable is done to:

(A) Decrease the effective R and L

(B) Increase the effective R and L

(C) Decrease the effective R but increase L

(D) Increase the effective R but reduce L

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68. The most frequently occurred fault in the power system is:

(A) L-L-G

(B) L-L

(C) L-L-L

(D) L-G

69. The transfer function model of a system is the reshaping of the differential equations of which type of system?

(A) linear time varying

(B) linear time invariant

(C) non-linear time invariant

(D) non-linear time varying

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70. The per unit value of a $2\ \Omega$ resistor at 100 MVA base and 10 kV base voltage is

(A) 2

(B) 4

(C) 0.5

(D) 0.2

---

71. Match the following electrical system with mechanical system based on current-force analogy:

Electrical System		Mechanical system	
A	Voltage	I	displacement
B	flux linkages	II	Moment of inertia
C	capacitance	III	torque
		IV	angular velocity

(A) A – IV, B – I, C – II

(B) A – I, B – II, C – III

(C) A – III, B – IV, C – II

(D) A – II, B – I, C – IV

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72. Compared with an induction motor, AC servo motor speed-torque characteristics and X/R ratio respectively are

(A) nearly linear, large

(B) more non-linear, large

(C) nearly linear, small

(D) more non-linear, small

---

73. The steady-state error of Type-2 system for a standard unit velocity input is

(A) $\frac{1}{1+K_v}$

(B) ∞

(C) $\frac{1}{K_v}$

(D) 0

---

74. The centroid of the following system is

$$G(s)H(s) = \frac{K(s+10)(s+20)}{s^3(s+100)(s+800)}$$

(A) 290

(B) -290

(C) 310

(D) -310

---

75. For the following system, the angles of asymptotes are

$$G(s)H(s) = \frac{K}{s(s^2+2s+1)}$$

(A) $45°, 135°, 225°$

(B) $60°, 180°, 300°$

(C) $90°, 270°$

(D) $30°, 150°, 270°$

---

76. Natural frequency of oscillations of the following transfer function is $\frac{C(s)}{R(s)} = \frac{1}{(s^2+0.5s+1)}$:

(A) $\omega_n = 0.5$

(B) $\omega_n = 2$

(C) $\omega_n = 0.25$

(D) $\omega_n = 1$

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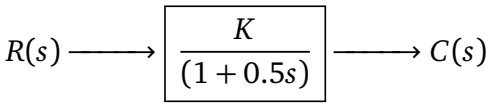
77. Sensitivity of the following open loop system is:



(A) 1

(B) 2/3

(C) 0.5

(D) 3/2

---

78. Which of the following pair of electro-mechanical devices are part of Synchro?

(A) AC tacho generator and Transmitter

(B) Transmitter and Control transformer

(C) DC tacho generator and Receiver

(D) Resolver and AC generator

---

79. Choose the correct statement with reference to standard test signals

(A) Unit impulse signal is obtained by integrating unit step signal

(B) Unit step signal is obtained by differentiating unit impulse signal

(C) Unit ramp signal is obtained by differentiating unit step signal

(D) Unit parabolic signal is obtained by integrating unit ramp signal

---

80. Time constant of a first order unit step input system is defined as the time at which unit step response reaches

(A) 63.2% of steady state value

(B) 66.7% of steady state value

(C) 36.8% of steady state value

(D) 33.3% of steady state value

---

81. Steady-state error of the following second order system for a unit ramp input is $\frac{C(s)}{R(s)} = \frac{\omega_n^2}{(s^2+2\zeta\omega_n s+\omega_n^2)}$:

(A) $\frac{\zeta}{2\omega_n}$

(B) $\frac{2\zeta}{\omega_n}$

(C) $\frac{\omega_n}{2\zeta}$

(D) $\frac{2\omega_n}{\zeta}$

---

82. For the given open loop system, the poles of unity feed-back closed loop system are $G(s) = \frac{1}{(s+2)(s+4)}$:

(A) $-3, 3$

(B) $-1, -3$

(C) $-3, -3$

(D) $1, 3$

---

83. Feeding the distributor at more than one point

(A) reduces the power loss in the distributor

(B) reduces the efficiency of the distributor

(C) increases the power loss in the distributor

(D) increases the total voltage drop in the distributor

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84. The state equation of a dynamical system is: $\dot{X} = AX + Bu$, where $[A]$ is a 3×3 system matrix and $[B]$ is a 3×1 input matrix. Then the controllability matrix Q_c is

(A) $Q_c = [B \mid AB \mid A^2B]$

(B) $Q_c = [A \mid AB \mid A^2B]$

(C) $Q_c = [B \mid AB \mid AB^2]$

(D) $Q_c = [B \mid A \mid A^2]$

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85. If transfer function of a controller is given by: $G_c(s) = \frac{(K_1 s^2 + K_2 s + K_3)}{s}$, then the proportional, integral and derivative constants are

(A) K_1, K_2 and K_3 respectively

(B) K_3, K_2 and K_1 respectively

(C) K_2, K_1 and K_3 respectively

(D) K_2, K_3 and K_1 respectively

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86. Which of the following bridge is not used for the measurement of capacitance?

(A) Schering bridge

(B) Wien's bridge

(C) De Sauty's bridge

(D) Hay's bridge

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87 An energy meter makes 600 revolutions per kWh. If it makes 300 revolutions in 30 minutes, then the load power is

(A) 0.5 kW

(B) 1 kW

(C) 2 kW

(D) 4 kW

---

88. Resolution of a $3\frac{1}{2}$ digit DVM is

(A) $\frac{1}{100}$

(B) $\frac{1}{1000}$

(C) $\frac{1}{2000}$

(D) $\frac{1}{10000}$

---

89. A DC potentiometer has a potential gradient of 20 mV/cm. The balancing lengths for a standard cell and an unknown voltage are 75 cm and 120 cm respectively. If the standard cell voltage is 1.50 V, then the unknown voltage is

(A) 1.80 V

(B) 2.00 V

(C) 2.40 V

(D) 3.20 V

---

90. A PMMC instrument has full-scale deflection current of $50\ \mu$A and coil resistance of 1 kΩ. The resistance to be added in series to convert it into 10 V voltmeter is

(A) 99 kΩ

(B) 199 kΩ

(C) 299 kΩ

(D) 399 kΩ

91. A moving-iron voltmeter reads correctly on DC. If connected to a 50 Hz sinusoidal AC source whose RMS value equals the DC value, then the reading will be

(A) greater than the DC reading

(B) less than the DC reading

(C) same as the DC reading

(D) zero

---

92. A current transformer has ratio 500/5. If the burden is 2 VA at rated secondary current, the corresponding burden impedance is

(A) 0.08 Ω

(B) 0.4 Ω

(C) 0.8 Ω

(D) 2.0 Ω

---

93. A digital frequency meter counts 5000 pulses during a gate time of 0.1 s. The measured frequency is

(A) 500 Hz

(B) 5 kHz

(C) 50 kHz

(D) 500 kHz

---

94. An analog instrument has a specified accuracy of ±1% of full-scale reading. If its full-scale value is 300 V and it reads 120 V, the maximum percentage error with respect to the indicated reading is

(A) 1%

(B) 1.5%

(C) 2.5%

(D) 5%

---

95. A strain gauge has gauge factor 2.1 and nominal resistance 120 Ω. If it is subjected to a strain of 1000 $\mu\varepsilon$, the change in resistance is

(A) 0.126 Ω

(B) 0.252 Ω

(C) 0.504 Ω

(D) 1.20 Ω

---

96. A silicon diode has a reverse saturation current of 10^{-12} A at 300 K. The approximate increase in temperature such that saturation current doubles is

(A) 5°C

(B) 10°C

(C) 15°C

(D) 20°C

---

97. A BJT in CE mode has $\beta = 120$ and collector current $I_C = 2.4$ mA. The small-signal transconductance at room temperature ($V_T \approx 25$ mV) is approximately

(A) 0.024 S

(B) 0.048 S

(C) 0.096 S

(D) 0.12 S

---

98. The transconductance of MOSFET in saturation is

(A) $k(V_{GS} - V_T)$

(B) $2k(V_{GS} - V_T)$

(C) kV_{DS}

(D) Constant

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99. A phase shift oscillator requires minimum gain of

(1) 1

(2) 10

(3) 29

(4) 100

---

100. An op-amp with slew rate 0.5 V/μs is used to generate a sine wave of amplitude 10 V. Maximum frequency without distortion is approximately

(1) 8 kHz

(2) 16 kHz

(3) 32 kHz

(4) 50 kHz

---

101. A first-order high-pass RC filter has cutoff frequency $f_c = 1$ kHz. If the magnitude of the transfer function is measured at $f = 500$ Hz, the gain magnitude is

(1) 0.25

(2) 0.45

(3) 0.71

(4) 0.89

---

102. A synchronous 3-bit binary counter is currently in state $Q_2Q_1Q_0 = 101$. After two clock pulses, its state will be

(1) 111

(2) 000

(3) 001

(4) 010

---

103. A 4-variable Boolean function is implemented using an 8:1 multiplexer. Three variables are used as select lines, and the remaining variable is connected appropriately to the data inputs. The minimum number of 8:1 multiplexers required to realize any arbitrary 4-variable Boolean function is

(1) 1

(2) 2

(3) 4

(4) 8

---

104. Resolution of an 8-bit ADC with 5V reference is

(1) 5 V

(2) 2.5 V

(3) 19.5 mV

(4) 39 mV

---

105. An 8085 microprocessor executes an instruction in 4 machine cycles containing 4, 3, 3, and 3 T-states respectively. If the clock frequency is 3 MHz, the execution time is approximately

(1) 3.33 μs

(2) 4.33 μs

(3) 4.67 μs

(4) 13.33 μs

---

106. The slip of a 3-ϕ, 50 Hz, induction motor fed by 3-ϕ, 50 Hz inverter is 's' at fundamental frequency. At 5^{th} harmonic frequency, the harmonic slip is nearly equal to

(1) $5s$

(2) $\frac{s}{5}$

(3) 1.2

(4) 1

---

107. A 3-ϕ, 50 Hz synchronous motor is to be operated at constant flux by frequency control. If frequency is decreased by 4% of rated frequency at the same flux, then the voltage should be

(1) Decreased by 4%

(2) Increased by 4%

(3) Decreased by 16%

(4) Constant

---

108. A power diode is open circuited, and a reverse dc voltage is applied to get a faster turn-off time. During reverse recovery time

(a) When current is negative peak, voltage is zero

(b) When voltage is negative peak, current is zero

(c) When current is negative peak, voltage is not zero

(d) When voltage is negative peak, current is not zero

Choose the correct answer

(1) (a) true, (c) true and (d) true

(2) (b) true, (c) true and (d) false

(3) (b) false, (c) false and (d) true

(4) (a) true, (c) false and (d) true

---

109. Power MOSFETs are extremely popular in

(1) Low voltage, low power and high frequency applications

(2) Low voltage, high power and high frequency applications

(3) High voltage, high power and low frequency applications

(4) High voltage, low power and low frequency applications

---

110. In IGBT an improved Miller feedback effect is seen (compared with MOSFET) because, ratio of gate-collector capacitance to gate-emitter capacitance is

(1) Unity

(2) Lower

(3) Higher

(4) Very large

---

111. In the first quadrant of V-I characteristics of Uni-Junction Transistor, the slopes of characteristic are in the following sequence

(1) Negative, zero, positive, zero and negative

(2) Positive, zero, negative, zero and positive

(3) Positive, zero, negative, zero and negative

(4) Negative, zero, positive, zero and positive

---

112. The triggering pulses for 1-ϕ, full wave converter using Zero Crossing Detector, pulse amplifier and gate pulse isolation transformer, are obtained during

(1) Ramp voltage with negative slope is less than control dc voltage

(2) Ramp voltage with negative slope is more than control dc voltage

(3) Missing Option

(4) Missing Option

---

113. A 3-ϕ semi-converter with R-L load consists of _____ diodes and operates in _____

(1) 4, four quadrants

(2) 3, four quadrants

(3) 4, one quadrant

(4) 3, one quadrant

---

114. A 3-ϕ fully controlled converter can be operated as a semi-converter, if

(a) One of the input ac supplies is disconnected and the thyristors connected to it are triggered at 180 degrees.

(b) One of the input ac supplies is disconnected and the thyristors connected to it are triggered at zero degrees.

(c) A free-wheeling diode can be connected across the load in the same direction of thyristors

(d) A free-wheeling diode can be connected across the load in the opposite direction of thyristors

Choose the correct answer

(1) (a) and (c) are false

(2) (b) and (d) are false

(3) (b) and (c) are true

(4) (d) and (a) are true

---

115. The input dc voltage of a 1-ϕ full bridge inverter is 141.4 V and its duty ratio is 0.49. Then its approximate average and rms voltages are

(1) 69.3 V and 202 V respectively

(2) 99 V and 202 V respectively

(3) 69.3 V and 99 V respectively

(4) 99 V and 69.3 V respectively

---

116. The fundamental frequency and peak voltage of an inverter are f and V_m respectively. When it contains all odd harmonics, then its frequency and rms voltage of 5^{th} harmonic are

(1) $5f$ and $\frac{5V_m}{\sqrt{2}}$ respectively

(2) $\frac{f}{5}$ and $\frac{V_m}{5}$ respectively

(3) $\frac{f}{5}$ and $\frac{V_m}{5\sqrt{2}}$ respectively

(4) $5f$ and $\frac{V_m}{5\sqrt{2}}$ respectively

117. If α is ratio $\frac{T_{ON}}{T}$ of chopper, then the ratio of input voltage to output voltage of step down and step-up chopper respectively are

(1) $\frac{1}{\alpha}$ and $(1-\alpha)$

(2) $\frac{1}{\alpha}$ and $\frac{1}{(1-\alpha)}$

(3) α and $(1-\alpha)$

(4) α and $\frac{1}{(1-\alpha)}$

---

118. For a step-down Type A chopper, the waveforms of input current I and output current I_o respectively are

(1) discontinuous and continuous for a resistive load

(2) discontinuous and discontinuous for a resistive load

(3) continuous and continuous for an inductive load

(4) continuous and discontinuous for an inductive load

---

119. The number of pulses per half cycle of PWM inverter is changed, then

(1) The rms output voltage does not change, but the frequency changes

(2) Both rms output voltage and output frequency do not change

(3) The rms output voltage changes, but the frequency does not change

(4) Both rms output voltage and output frequency change

---

120. A dc motor is connected to a 214 V rms (L-L), 3-ϕ, 50 Hz line using a 3-ϕ bridge converter. If the firing angle is $\frac{\pi}{6}$, full load armature current is 2500 A and armature resistance is 4 mΩ, then the back emf is

(1) 204 V

(2) 260.3 V

(3) 250.3 V

(4) 240.3 V
