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POLYTECHNIC TRB

ELECTRICAL AND ELECTRONICS ENGINEERING



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PART-A

1. If the sum of three Eigen values and trace of 3 × 3 matrix A are equal, then the value of determinant of A is :

A) 1

B) 0

C) 2

D) 3

Correct Answer:- *

2. If $\vec{F} = (x^2 - y^2 + 2xz)\vec{\imath} + (xz - xy + yz)\vec{\jmath} + (z^2 + x^2)\vec{k}$ then div(curl$\vec{F}$) is:

A) 0 - **(Correct Answer)**

B) $\vec{\imath} + \vec{\jmath}$

C) 6

D) $-(x + y)\vec{\imath} + (y + z)\vec{k}$

3. A linear differential equation with constant co-efficients corresponding to $(2x + 3)^2 \frac{d^2y}{dx^2} + 2(2x + 3)\frac{dy}{dx} - 12y = 6x$ by using $z = \log(2x + 3)$, is :

A) $\frac{d^2y}{dz^2} + 3y = \frac{3}{4}(e^z + 3)$

B) $\frac{d^2y}{dz^2} - 2\frac{dy}{dz} + 12y = \frac{3}{4}(e^z + 3)$

C) $\frac{d^2y}{dz^2} - 3y = \frac{3}{4}(e^z - 3)$ – **(Correct Answer)**

D) $\frac{d^2y}{dz^2} - 2\frac{dy}{dz} + 12y = 3(e^z - 3)$

4. If $\int_{-3}^{0} g(t)dt = \sqrt{2}$ then $\int_{0}^{-3} g(x)dx$ is :

A) $-\sqrt{2}$ – **(Correct Answer)**

B) $\sqrt{2}$

C) $1/\sqrt{2}$

D) $-1/\sqrt{2}$

5. If $L[f(t)] = \phi(s)$ then the relation between the Laplace transform of $f(t)$ and $f(at)$ is :

A) $L[f(at)] = a\phi(as)$

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B) $L[f(at)] = \frac{1}{a}\phi(s/a)$ – **(Correct Answer)**

C) $L[f(at)] = \frac{1}{a}\phi(as)$

D) $\mathrm{L[f(at)] = a\phi(s/a)}$

6. If $w = u(x, y) + iv(x, y)$ is an analytic function of z, then $\frac{dw}{dz}$ is :

A) $\mathrm{i}\frac{\partial w}{\partial x}$

B) $-\mathrm{i}\frac{\partial W}{\partial x}$

C) $\mathrm{i}\frac{\partial w}{\partial y}$

D) $-\mathrm{i}\frac{\partial W}{\partial y}$ – **(Correct Answer)**

7. The order of convergence of Newton method is :

A) linear

B) cubic

C) quadratic - **(Correct Answer)**

D) biquadratic

8. The solution of $\frac{\partial^2 z}{\partial y^2} = \sin xy$ is :

A) $z = \frac{1}{x^2}\sin(xy) + xf(y) + g(y)$

B) $z = -\frac{1}{x^2}\sin(xy) + y\phi(x) + g(x)$ - **(Correct Answer)**

C) $z = \frac{1}{y^2}\sin(xy) + y\phi(x) + g(x)$

D) $z = -\frac{1}{y^2}\sin(xy) + xf(y) + g(y)$

9. If the Fourier Transform of f(x) is F(s) then the Fourier transform of f(x)cos ax is :

A) $\frac{1}{2}[F(s + a) + F(s - a)]$

- (Correct Answer)

B) $\mathrm{F(s + a) + F(s - a)}$

C) F (s+a)-F(s-a)

D) $\frac{1}{2}[F(s + a) - F(s - a)]$

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10. If the Laplace transform of $f(t)$ is $\frac{1}{S(S+2)^2}$, then $\underset{t\to\infty}{\text{Lt}}\, f(t)$ is :

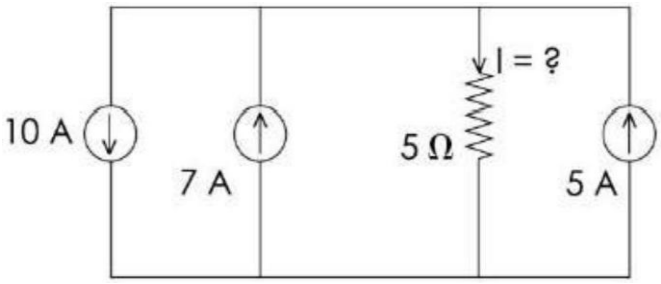
A) 4

B) $\frac{1}{4}$-**(Correct Answer)**

C) 0

D) 2

11. Find the current and the voltage drop across the 5Ω resistor for the circuit shown :



A) -2 A, 5 V

B) 2 A, 10 V $-$ **(Correct Answer)**

C) 2 A, -10 V

D) 2 A, 5 V

12. Node voltage analysis can be carried out on :

A) Planar and Non-planar networks - **(Correct Answer)**

B) Planar networks only

C) Non-planar networks only

D) Neither planar nor non-planar networks

13. With regard to the Thevenin's equivalent network representation, which of the following is NOT CORRECT ?

A) Voltage sources in Thevenin's equivalent circuit is the open-circuit voltage of network when load is removed

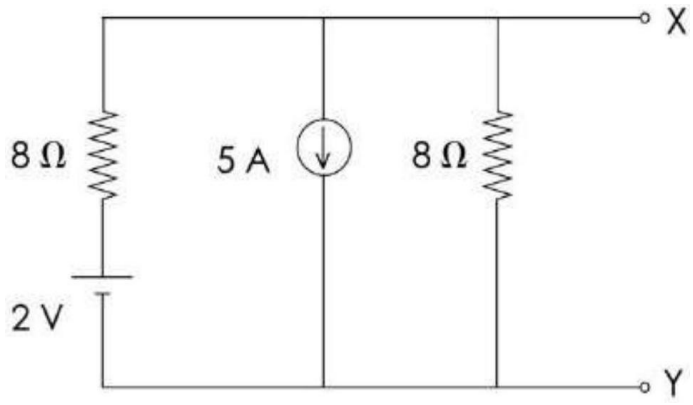
B) Thevenin's equivalent resistance is calculated considering all the voltage sources are short-circuited

C) Thevenin's equivalent resistance is calculated considering all the voltage sources are open-circuited - **(Correct Answer)**

D) Thevenin's equivalent resistance is calculated considering all the current sources are open circuited

14. Find the Norton's equivalent resistance of the network below :

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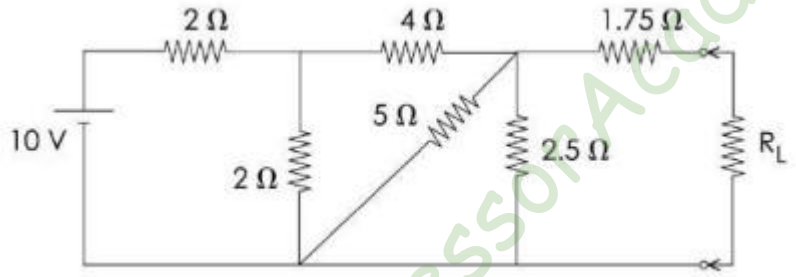
A) 16Ω

B) 4 Ω - **(Correct Answer)**

C) 8Ω

D) 32Ω

15. Find the value of the load resistance (R_l) for the given circuit under the condition of maximum power transfer :



A) 2 Ω

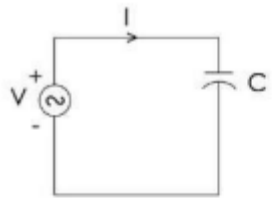
B) 3 Ω — **(Correct Answer)**

C) 4 Ω

D) 2.5 Ω

16. Which of the following vector diagrams is CORRECT for the circuit shown ?

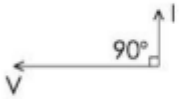
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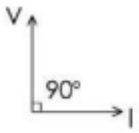
A :



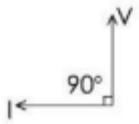
B :



C :



D :



– (Correct Alternative)

17. The voltage across R and L in a series R-L circuit are found to be 40 V and 30 V respectively. The r.m.s. value of the voltage across the series combination is :

A) 50 V - **(Correct Answer)**

B) 25 V

C) 45 V

D) 80 V

18. In an R-L-C series transient circuit, the output current wave yields a critical damped case when :

A) $\left(\frac{R}{2L}\right) = \frac{1}{\sqrt{LC}}$

B) $\frac{R}{2L} = \frac{1}{LC}$

C) $(R/2L)^2 = (1/LC)^2$

D) $(R/2L)^2 = 1/LC$ — **(Correct Answer)**

19. In an R-L-C series circuit connected to an alternating current source, at

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resonance, the voltage magnification occurs across :

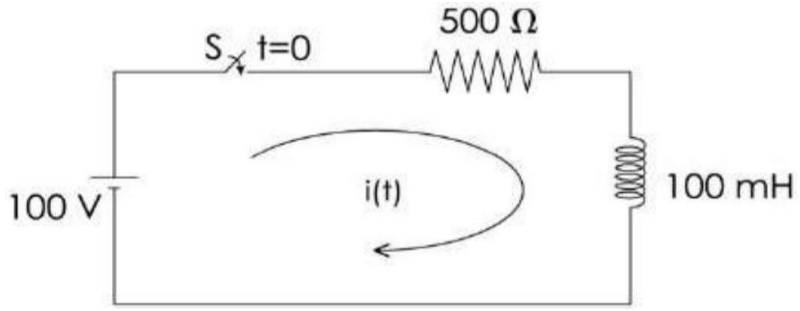
A) resistor

B) resistor and inductor combination

C) resistor, inductor and capacitor combination

D) capacitor - **(Correct Answer)**

20. For the circuit shown, the time varying current is given by :



A) $0.2\ (1 - e^{-5000t})$ — **(Correct Answer)**

B) $0.2\ (1 - e^{-500t})$

C) $0.2\ (1 - e^{-1000t})$

D) $0.2\ (1 - e^{-100t})$

21. Identify the causal signal :

A) $x(n) = a^n u(-n + 1)$

B) $x(n) = a^n u(n)$ - **(Correct Answer)**

C) $x(n) = a^n u(-n - 1)$

D) $x(n) = a^n u(-n + 1) + u(n)$

22. The Fourier spectrum of an aperiodic sequence is ___ and periodic with period ___ .

A) discontinuous, 2π

B) continuous , 2π - **(Correct Answer)**

C) discontinuous, $\frac{\pi}{2}$

D) continuous, $\frac{\pi}{2}$

23. Which one of the following is correct answer with respect to Region of

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Convergence (ROC) ?

A) The ROC is a ring in the z-plane not centred at the origin

B) The ROC of LTI stable system does not contain the unit circle

C) The ROC cannot contain any poles - **(Correct Answer)**

D) The ROC must not be a connected region

24. The frequency range of EEG signal is :

A) 0-100 Hz - **(Correct Answer)**

B) 0-10 Hz

C) 0-1 kHz

D) 100-1 kHz

25. Fourier transform of a discrete and aperiodic sequence is ___ and ___ .

A) continuous, periodic - **(Correct Answer)**

B) continuous, aperiodic

C) discontinuous, periodic

D) discontinuous, aperiodic

26. A discrete time system is called as static if its output at any instant 'n' depends on the input sample at the :

A) same and past time

B) same and future time

C) same time only - **(Correct Answer)**

D) future time only

27. The discrete time fourier transform of a sequence x(n) is represented as :

A) $X(e^{-j\omega})$

B) $X(e^{-j\pi\omega})$

C) $X(e^{j\pi\omega})$

D) $X(e^{j\omega})$ - **(Correct Answer)**

28. The higher rate of oscillation in a discrete time signal is attained when f = ___ .

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A) 1/3

B) 1/4

C) 1/2 — **(Correct Answer)**

D) 1/5

29. A signal x(n) is periodic with period N($N > 0$) if and only if :

A) $x(n + N) = x(n)$ for all n - **(Correct Answer)**

B) $x(n + N) = x(n)$ for only $n = 0$

C) $x(n + N) = x(n)$ for only $n > 0$

D) $x(n + N) = x(n)$ for only $n < 0$

30. The time shifting property of z-transform is written as if $x(n) \overset{z}{\leftrightarrow} x(z)$, then

A) $x(n-k) \overset{Z}{\leftrightarrow} z^{-k}x(z)$ - **(Correct Answer)**

B) $x(n-k) \overset{Z}{\leftrightarrow} z^{k}x(z)$

C) $x(n-k) \overset{Z}{\leftrightarrow} z^{-k+1}x(z)$

D) $x(n-k) \overset{Z}{\leftrightarrow} z^{k+1}x(z)$

31. The stator of 3 phase induction motor has 3 slots per pole per phase. If supply frequency is 50 Hz , the speed of the rotating stator flux is ___ .

A) 1500 rpm

B) 750 rpm

C) 1000 rpm

D) 1250 rpm

Correct Answer: - *

32. A 746 kW, 3 phase, 50 Hz , 16 pole induction motor has rotor impedance of $(0.02 + j0.15)\Omega$ at standstill. Full load torque is obtained at 360 rpm. Determine the speed at which maximum torque will occur ___ .

A) 325 rpm - **(Correct Answer)**

B) 350 rpm

C) 400 rpm

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D) 430 rpm

33. The stator loss of a 3 phase induction motor is 2 kW. When the power input is 90 kW. What will be the rotor copper loss and mechanical power developed if the motor is running at a 4% slip ?

A) 6.32 kW and 78.32 kW

B) 3.52 kW and 84.48 kW - **(Correct Answer)**

C) 9.8 kW and 65.32 kW

D) 4.63 kW and 80 kW

34. If the field excitation of 10 A in a synchronous generator gives the armature current of 150 A on a short circuit and the terminal voltage of 900 V on open circuit, what will be the internal voltage drop with a load current of 60 A ? Neglect synchronous resistance.

A) 300 V

B) 360 V - **(Correct Answer)**

C) 420 V

D) 260 V

35. Torque-Speed characteristics of 3 phase induction motor is similar to ___ .

A) dc series motor

B) dc shunt motor - **(Correct Answer)**

C) dc differential compound motor

D) dc cummulative compound motor

36. The power input to a 3 phase induction motor is 60 kW . The total stator loss is 1 kW . Find the mechanical power developed, if the motor is running with a slip of 3%.

A) Pm = 50.77 kW

B) Pm = 44 kW

C) Pm = 57.23 kW – **(Correct Answer)**

D) Pm = 30 kW

37. A 250 V, 4 pole wave wound dc series motor has 782 conductors on its armature. It has armature and series field resistance of 0.75Ω. The motor takes a current of 40 A. Estimate its gross torque developed if it has a flux per pole of 25 mWb.

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A) 300 N-m

B) 400.7 N-m

C) 347.5 N-m

D) 249 N-m - **(Correct Answer)**

38. The maximum value of torque angle in a cylindrical rotor synchronous motor is ___ degree electrical.

A) 45

B) 90 - **(Correct Answer)**

C) < 45

D) > 90

39. A sinusoidal flux 0.02 Wb (maximum) links with 55 turns of transformer secondary. Calculate the RMS value of the induced emf in secondary. The supply frequency is 50 Hz.

A) 264.2 V

B) 232.2 V

C) 244.2 V - **(Correct Answer)**

D) 252.2 V

40. Disadvantage of short pitch coil in the alternator is ___ .

A) harmonics are introduced

B) waveform becomes non-sinusoidal

C) voltage around the coil is reduced - **(Correct Answer)**

D) None of the options

41. When a L-L fault occurs, the zero sequence current is j 3.553 p.u. The fault current in this case will be :

A) 2 x j 3.553 p.u.

B) $\sqrt{2} \times$ j3.553 p.u.

C) 3 * j 3.553 p.u.

D) $\sqrt{3} \times$ j3.553 p.u.

Correct Answer:- *

42. Diversity factor of a power station will always be :

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A) Greater than 1 - **(Correct Answer)**

B) Equal to 1

C) Less than 1

D) Zero

43. The concept of self GMD is applicable for :

A) Capacitance

B) Both capacitance and Inductance

C) Inductance - **(Correct Answer)**

D) Resistance

44. The method of symmetrical components is applicable to :

A) Only three phase system

B) Any polyphase system - **(Correct Answer)**

C) Only single phase system

D) Only two phase system

45. If the breaker reclose after some time corresponding to clearing angle δ_c when the fault vanished, the output will be more than the input and hence the rotor :

A) Decelerates - **(Correct Answer)**

B) Accelerates

C) Stand still

D) No change

46. If the reactive power generation violates, the voltage controlled bus is made to act as a :

A) Load bus - **(Correct Answer)**

B) Generator bus

C) Slack bus

D) Reference bus

47. The radio interference due to corona is of importance for line above ___ kV.

A) 500 - **(Correct Answer)**

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B) 100

C) 200

D) 600

48. In practice, the line drop compensation is limited to ___ in voltage control of transmission line by transformer tap changing.

A) 0.7%

B) 1.7%

C) 3.7% - **(Correct Answer)**

D) 5.7%

49. The value to which the power factor should be improved so as to have maximum net annual saving is known as the :

A) Best power factor

B) Maximum power factor

C) Most economical power factor - **(Correct Answer)**

D) Unity power factor

50. The transmission line loading condition, in which the VARs absorbed are equal to the VARs generated is called :

A) Inductive reactance

B) Natural impedance

C) Surge impedance - **(Correct Answer)**

D) Capacitive reactance

51. The value of the preset current above which the relay operates is known as :

A) Pick-up value - **(Correct Answer)**

B) Reset value

C) Definite value

D) Instantaneous value

52. The bias of the percentage differential relay is the :

A) ratio of the number of turns in the operating coil (N_o) to the number of turns in the restraining coil (N_r)

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B) ratio of the number of turns in the restraining coil (N_r) to the number of turns in operating coil (N_o) - **(Correct Answer)**

C) ratio of number of turns in primary side to the number of turns in secondary side of CT

D) ratio of number of turns in secondary side to the number of turns in primary side of CT

53. Distance protection is a widely used protective scheme for :

A) Generators

B) Bus bars

C) HV and EHV transmission lines - **(Correct Answer)**

D) Transformers

54. Phase comparator can be realized by :

A) Sampling Comparator

B) Seebeck Effect

C) Raman Effect

D) Hall Effect - **(Correct Answer)**

55. In a digital protection scheme, the component necessary to make the signals from the transducer compatible with the analog interface is :

A) Signal conditioner - **(Correct Answer)**

B) Current transformer

C) Filters

D) Analog multiplexer

56. A protective relay detects abnormal conditions and sends a tripping signal to the :

A) Current transformer

B) Potential transformer

C) Circuit breaker - **(Correct Answer)**

D) Bus bar

57. The voltage drop across the arc is called :

A) Restriking voltage

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B) Recovery voltage

C) Fault voltage

D) Arc voltage - **(Correct Answer)**

58. If the operating time is constant, irrespective of the magnitude of the current above the pick-up value, then it is :

A) Instantaneous over current relay

B) Definite-time over current relay - **(Correct Answer)**

C) Differential relay

D) Impedance relay

59. To maintain the synchronism between the synchronous generators in a power system the term used is :

A) reliability

B) stability - **(Correct Answer)**

C) integrity

D) alignment

60. The knowledge of ___ is quite helpful in high voltage measurements.

A) Form factor

B) Peak value

C) Crest factor - **(Correct Answer)**

D) RMS value

61. The polar plot of $G(j\omega) = \frac{j\omega T}{1+j\omega T}$ for $0 \leq \omega \geq \infty$ is :

A) Elliptical

B) Circular - **(Correct Answer)**

C) Hyperbolic

D) Parabolic

62. Corner frequencies of bode plot of lead compensator are ω_1 and ω_2. The maximum phase lead angle given by the compensator is :

A) $\sqrt{\omega_1 * \omega_2}$ – **(Correct Answer)**

B) $\sqrt{\omega_1 + \omega_2}$

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C) $\frac{1}{\sqrt{\omega_1 * \omega_2}}$

D) $\omega_1 * \omega_2$

63. If lead compensator for a system is given by; $G_c(s) = K_c * \frac{s+4.41}{s+18.4}$. Then the new gain cross over frequency of compensated system is given by :

A) 0.227 rad/sec

B) 12.2 rad/sec

C) 9 rad/sec

D) 7.5 rad/sec

Correct Answer: - *

64. The overall transfer function of a control system is given below; $\frac{C(s)}{R(s)} = \frac{25}{s^2+5\sqrt{2}\,s+25}$ Then the resonant peak Mr is :

A) 0.5

B) $\sqrt{2}$

C) 2

D) 1 - **(Correct Answer)**

65. If peak overshoot of system is 100% then damping ratio is :

A) 1

B) 0 - **(Correct Answer)**

C) 0.5

D) infinity

66. The phase lag-lead network shifts the phase of control signal in order that output phase :

A) lags at low frequencies and leads at high frequencies - **(Correct Answer)**

B) leads at low frequencies and lags at high frequencies

C) becomes independent of frequencies

D) leads at all frequencies

67. The characteristics equation of a system is given by : $s^3 + 3s^2 + (4 + k)s +$

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$2 + 2k = 0$

The bound on the value of 'k' for which the system would be stable is :

A) $k \geq -10$

B) $k \geq 10$

C) $k \geq -1$ - **(Correct Answer)**

D) $k \geq 1$

68. For a system with open loop transfer function : $G(s)H(s) = \frac{1}{(s^2+2s+2)(s+2)}$

What is the phase cross over frequency ?

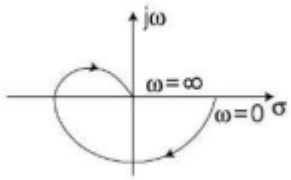
A) $\sqrt{6}$ - **(Correct Answer)**

B) $\sqrt{8}$

C) $\sqrt{2}$

D) $\sqrt{4}$

69. The order of differential equation governing a system having its polar plot as shown in below :



A) 0

B) 1

C) 2

D) 3 - **(Correct Answer)**

70. A cascade forward path compensator designed for a system has transfer function given by $G_c(s) = \frac{s+0.05}{s+0.005}$

This compensator will improve the following :

A) Peak overshoot of the system

B) Damping factor of the system

C) Steady state error of the system - **(Correct Answer)**

D) None of the options

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71. Which are of the following statements about internal resistance of measuring instruments is true?

A) The internal resistance of ammeters should be very small and that of voltmeters very high - **(Correct Answer)**

B) The internal resistance of ammeters should be very high and that of voltmeters very small

C) The internal resistance of ammeters and voltmeters should be very small

D) The internal resistance of ammeters and voltmeters should be very high

72. In an induction type energy meter :

A) There is no brake magnet

B) There is a control spring

C) Disc revolves continuously - **(Correct Answer)**

D) There is no temperature error

73. Loss of charge method is used for measurement of :

A) Low resistance

B) High resistance - **(Correct Answer)**

C) Low inductance

D) High inductance

74. A Merz Price Maximum Demand Indicator indicates :

A) Maximum demand.

B) Average maximum demand over a specified period of time. - **(Correct Answer)**

C) Maximum energy consumption.

D) Maximum demand, Average maximum demand over a specified period of time and

75. The burden of current transformer is expressed in terms of :

A) Secondary winding current.

B) VA rating of transformer. - **(Correct Answer)**

C) Voltage, current and power factor of secondary winding circuit.

D) None of the options

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76. A resistance is classified as low resistance if its resistance value is :

A) Above 10 Ohms

B) Below 10 Ohms

C) More than one but below 5 Ohms

D) Below one Ohm - **(Correct Answer)**

77. The material used for springs in a PMMC instrument is :

A) Platinum

B) Copper

C) Phosphor bronze - **(Correct Answer)**

D) Steel

78. Shunts are made of :

A) Copper

B) Manganin - **(Correct Answer)**

C) Silver

D) Phosphor bronze

79. In a two wattmeter method of power measurement in a three phase circuit the two wattmeters read equally, when the power factor angle is :

A) 458

B) 608

C) 908

D) 08

Correct Answer:- *

80. The resolution of a system refers to :

A) Smallest change in the measure and that can be measured - **(Correct Answer)**

B) True value of the input

C) Retardation of the response

D) None of the options

81. The capacitance of the diode will ___ exponentially with increase in the forward bias voltage.

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A) Decrease

B) Increase - **(Correct Answer)**

C) Reduce by half

D) No change

82. The phase difference between the input signal and output signal voltage of a transistor connected in common-Emitter configuration is ___ .

A) 0°

B) 180° — **(Correct Answer)**

C) 90°

D) 270°

83. The stabilisation of operating point in potential divider method is provided by :

A) R_E consideration - **(Correct Answer)**

B) R_c consideration

C) V_{cc} consideration

D) R_1 and R_2

84. The final stage of a multistage amplifier uses ___ .

A) RC coupling

B) Transformer coupling - **(Correct Answer)**

C) Direct coupling

D) Impedance coupling

85. Field Effect Transistor [FET] is used as a ___ .

A) Current Controlled Device

B) Voltage Controlled Device - **(Correct Answer)**

C) Power Controlled Device

D) Both Current Controlled Device and Power Controlled Device

86. Hartley Oscillator is commonly used in :

A) Radio Receivers - **(Correct Answer)**

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B) Radio Transmitters

C) TV Receivers

D) TV Transmitters

87. The use of negative feedback in operational amplifier :

A) Increases the input and output impedances

B) Increases the input impedance and Bandwidth - **(Correct Answer)**

C) Decreases the output impedance and Bandwidth

D) Does not affect impedance (or) Bandwidth

88. The ___ of an A/D converter is defined as the smallest change in analog input for a one bit change at the output.

A) Linearity

B) Resolution - **(Correct Answer)**

C) Accuracy

D) Settling Time

89. Pulse position Modulator electronic circuit operates on ___ mode.

A) Astable - **(Correct Answer)**

B) Monostable

C) Bistable

D) Both Monostable and Bistable

90. The roll-off rate of an active filter ___ with the order of the filter.

A) Decreases

B) Increases ___ **(Correct Answer)**

C) Both Decreases and Increases

D) No Change

91. The average current rating of a semiconductor diode will be maximum for :

A) full wave rectified ac

B) half wave rectified ac

C) pure ac

D) pure dc - **(Correct Answer)**

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92. MOSFETs are preferred for high frequency applications. The reason that can be attributed to this property is :

A) high input impedance of the MOSFETs

B) positive temperature co-efficient of the MOSFETs

C) the absence of minority storage charge in the MOSFETs - **(Correct Answer)**

D) smaller leakage current of MOSFETs

93. For the power semiconductor devices IGBT, MOSFET, diode and transistor, which one of the following statements is TRUE ?

A) All the four are majority carrier devices

B) All the four are minority carrier devices

C) IGBT and MOSFET are majority carrier devices, whereas diode and thyristor are minority carrier devices

D) MOSFET is majority carrier device, whereas IGBT, diode and thyristor are minority carrier devices - **(Correct Answer)**

94. A half controlled single-phase bridge rectifier is supplying an R-L load. It is operated at a firing angle α and the load current is continuous. The fraction of cycle that the freewheeling diode conduct is :

A) 1/2

B) $(1 - \alpha/\pi)$

C) $\frac{\alpha}{2\pi}$

D) $\frac{\alpha}{\pi}$ - **(Correct Answer)**

95. In a two-quadrant dc-dc chopper, the load voltage is varied from positive maximum to negative maximum by varying the time-ratio of the chopper from :

A) zero to unity

B) unity to zero - **(Correct Answer)**

C) zero to 0.5

D) 0.5 to zero

96. A dc battery is charged from a constant dc source of 200 V through a chopper. The dc battery is to be charged from its internal emf of 90 to 120 V. The battery has internal resistance of 1Ω. For a constant charging current of 10 A, the range of duty cycle is :

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A) 0.45 to 0.6

B) 0.5 to 0.65 - **(Correct Answer)**

C) 0.4 to 0.55

D) 0.5 to 0.6

97. Compared to a single phase half-bridge inverter, the output power of a single phase full-bridge inverter is higher by a factor of :

A) 12

B) 8

C) 4 - **(Correct Answer)**

D) 2

98. The power delivered to a star connected load of RΩ per phase, from a 3-phase bridge inverter fed from fixed dc source is 10 kW for 180° mode. For 120^0 mode, the power delivered to load would be :

A) 10 kW

B) 5 kW

C) 6.667 kW

D) 7.5 kW - **(Correct Answer)**

99. An ac induction motor is used for speed control application. It is driven from an inverter with a constant V/f control mode. The motor name-plate details are as follows :

V: 415 V; Ph: 3; f: 50 Hz; N: 2850rpm The motor is run with the inverter output frequency set at 40 Hz and with half the rated slip. The running speed of the motor is :

A) 2400 rpm

B) 2280 rpm

C) 2340 rpm - **(Correct Answer)**

D) 2790 rpm

100. A three-phase induction motor operates at constant slip frequency while the stator frequency is varied from zero to rated value. Which one of the following statements is correct ? The torque developed by the motor is :

A) proportional to speed

B) proportional to square of speed

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C) inversely proportional to speed

D) constant in the complete range upto base speed - **(Correct Answer)**

101. Two alloys contain Silver and Copper in the ratio of 3 : 1 and 5 : 3. In what ratio the two alloys should be added together to get a new alloy if Silver and Copper in the ratio 2 : 1 ?

A) 3 : 2 or 1 : 3

B) 6 : 3 or 1 : 2 - **(Correct Answer)**

C) 3 : 6 or 1 : 2

D) 1 : 2 or 3 : 6

102. Who was the Revenue Minister during Rajaji's first Regime ?

A) R. Shunmugham Chetty

B) T. Prakasam - **(Correct Answer)**

C) O.P. Ramaswami Reddiar

D) K. Kamaraj

103. ___ is the unit of distance used to measure astronomical objects outside the solar system.

A) Fermi

B) Kilometre

C) Angstrom

D) Parsec - **(Correct Answer)**

104. Which one of the following is a natural polymer ?

A) Celluloid

B) Viscose rayon

C) Pyroxylin

D) Cellulose - **(Correct Answer)**

105. Which Inscription mentions Pandyan Nedunjeliyan ?

A) Pugalur Inscriptions

B) Mangulam Inscriptions - **(Correct Answer)**

C) Tiruparankundram Inscriptions

D) Alagar Malai Inscriptions

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106. Who is called the Father of the Tamil Press ?

A) Francis Xavier

B) Francis Martin

C) Joseph Dupleix

D) Henriques - **(Correct Answer)**

107. Who started the Swatandra Party ?

A) E.V. Ramasamy

B) Rajaji - **(Correct Answer)**

C) Kamaraj

D) C.N. Annadurai

108. Who introduced the Scheme of "Padiyarisi" ?

A) Kamaraj

B) C.N. Annadurai - **(Correct Answer)**

C) M. Karunanithi

D) M.G. Ramachandran

109. The widespread fire in the forest of Indonesia in 1997-98 was related to drought resulting from :

A) 'Slash and burn' agriculture

B) La Nino event

C) El Nino event - **(Correct Answer)**

D) Faulty water resource management

110. 'Mango showers' rainfall are common in South India during the month of :

A) December and January

B) August and September

C) February and March

D) April and May - **(Correct Answer)**

PART-B

1. The change of order of integration in $\int_0^1 \int_y^{2-y} xydxdy$ is :

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A) $\int_0^1 \int_x^{2-x} xy\, dy\, dx$

B) $\int_0^1 \int_0^x xy\, dy\, dx + \int_0^2 \int_0^{2-x} xy\, dy\, dx$

C) $\int_0^1 \int_0^x xy\, dy\, dx + \int_1^2 \int_0^{2-x} xy\, dy\, dx$ - **(Correct Answer)**

D) $\int_0^2 \int_x^{2-x} xy\, dy\, dx$

2. The absolute maximum and minimum values of $f(x) = x^{2/3}$ on the interval [-2, 3] are:

A) $(\sqrt[3]{9}, \sqrt[3]{4})$

B) $(\sqrt[3]{9}, 0)$ – **(Correct Answer)**

C) $(\sqrt[3]{4}, \sqrt[3]{9})$

D) $(\sqrt[3]{4}, 0)$

3. The Fourier transform of $f(x) = \begin{cases} 1 & : |x| \le 1 \\ 0 & : |x| > 1 \end{cases}$ is :

A) $\sqrt{\frac{2}{\pi}} \cdot \left(\frac{\sin s}{s}\right)$ –(Correct Answer)

B) $\sqrt{\frac{\pi}{3}} \cdot \left(\frac{\sin s}{s}\right)$

C) $\sqrt{\frac{\pi}{4}} \cdot \left(\frac{\sin 2s}{s}\right)$

D) $\sqrt{\frac{\pi}{3}} \cdot \left(\frac{\sin 2s}{s}\right)$

4. At the point $x = 0.1$, the solution of $\frac{dy}{dx} = x^2 - y, y(0) = 1$, using Taylor series method, is given by :

A) 0.696912

B) 0.757216

C) 0.895215

D) 0.905125 - **(Correct Answer)**

5. In the region $0 < r < 0.5$ m, in cylindrical co-ordinates, the current density is $\bar{J} = 4.5e^{-2r'} \hat{a}_z (A/m^2)$ and $\bar{J} = 0$ elsewhere. Use Amperes law and find $\bar{H}$.

A) $(1.125/r^2)(5 - e^{-3r} - 4re^{-2r})\, \hat{a}\varphi$ A/m

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B) $(1.125/r)(1 - e^{-2r} - 2re^{-2r})$ âφ A/m — **(Correct Answer)**

C) $(1.125/r^2)(3 - e^{-r} - 4re^{-3r})$ âφ A/m

D) $(1.125/r)(5 - e^{-3r} - 2re^{-3r})$ âφ A/m

6. In the region $r \leq 2, \bar{D} = \frac{5r^2}{4}\hat{r}$ and $r > 2, \bar{D} = \frac{20}{r^2}\hat{r}$, in spherical coordinates. Find the charge density for r > 2.

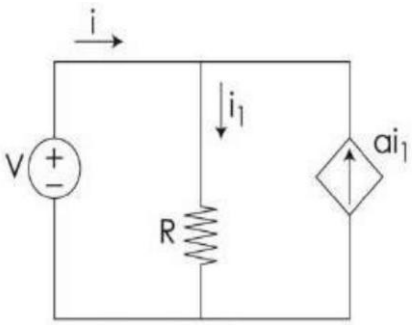
A) 5r

B) 5/r

C) 5

D) 0 - **(Correct Answer)**

7.



In the circuit, let $a = 2$. Connect a resistor R_x in parallel with the voltage source and adjust it within the range $0 \leq R_x \leq 0.99R$ such that the voltage source delivers minimum power. Find the value of R_x and power delivered by the voltage source.

A) 9.99R, $V^2/99R$

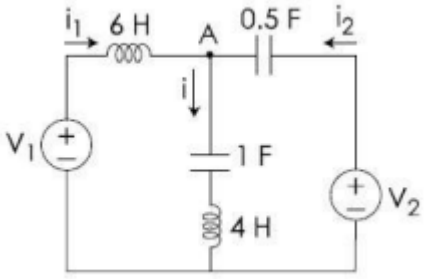
B) 99.9R, $V^2/9.9R$

C) 0.99R, $V^2/9.9R$

D) 0.99 R, $V^2/99R$ - **(Correct Answer)**

8. In the circuit $V_1 = 6\cos\omega t$ and $V_2 = \cos(\omega t + 60°)$. Find V_a, if $\omega = 2$ rad/sec.

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A) V_a = 1.11 sin2t — **(Correct Answer)**

B) V_a = 3.33 sin2t

C) V_a = 1.11 sin4t

D) V_a = 3.33 sin4t

9. Consider the analog signal, $x_a(t) = 5 \cos 100\pi t$.
Find the minimum sampling rate to avoid aliasing.

A) f_s = 50 Hz

B) f_s = 100 Hz — **(Correct Answer)**

C) f_s = 200 Hz

D) f_s = 500 Hz

10. The system, $y(n) = x(n) - x(n-1)$ is :

A) causal - **(Correct Answer)**

B) non causal

C) either causal or non causal

D) neither causal nor non-causal

11. The summation of signal, $\sum_{n=-\infty}^{\infty} \delta(n-2)\sin 2(n)$ is ___ .

A) 1

B) sin 4 - **(Correct Answer)**

C) sin 2

D) 0

12. The fourier transform of the signal $\delta(n)$ is :

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A) 1 - **(Correct Answer)**

B) 0

C: e^{-2j}

D) e^{2j}

13. Considering unit value as reference, match the approximate values of armature current and speed in Column 2 with respective condition in Column 1. Select the correct answer in the code given below :

	Column 1		**Column 2**	
(a)	Terminal voltage halved, field current and load torque constant	(i)	0.5	0.5
(b)	Terminal voltage halved, field current and power output constant	(ii)	1.0	0.5
(c)	Field flux doubled, armature voltage and load torque constant	(iii)	2.0	0.5
(d)	Field flux halved, armature voltage halved and power output constant	(iv)	2.0	1.0

A) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

B) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

C) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

D) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv) - **(Correct Answer)**

14. A 220 V, 50 Hz, transformer with 0.35 mm thick laminations has eddy current loss of 120 watts which is two-third of the total loss at no-load. If the transformer is built with 0.7 mm thick laminations and is worked from 110 V, 25 Hz, then total no-load loss would be :

A) 150 W - **(Correct Answer)**

B) 510 W

C) 200 W

D) 45 W

15. A three phase delta connected squirrel cage induction motor has a starting current I_d and a starting torque T_d at rated voltage. If the starting current and starting torque while the motor is started through star-delta started and auto-transformer (with 60% voltage) starter alternatively are l_y, T_y and lout Tout

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respectively, then.

$\frac{I_y}{I_d} : \frac{I_{out}}{I_d} : \frac{T_y}{T_d} : \frac{T_{out}}{T_d}$ **is equal to.**

A $: \frac{1}{\sqrt{3}} : 0.6 : \frac{1}{\sqrt{3}} : 0.6$

B) $\frac{1}{3} : 0.6 : \frac{1}{3} : 0.36$ **(Correct Answer)**

C $: \frac{1}{3} : 0.36 : \frac{1}{\sqrt{3}} : 0.6$

D $: \frac{1}{\sqrt{3}} : 0.36 : \frac{1}{3} : 0.36$

16. A 3 phase synchronous motor, connected to an infinite bus, is operating with normal excitation. With decrease in load :

a) Armature current decreases

b) P.f. becomes lagging

c) P.f. becomes leading

d) load angle decreases

e) reactive power flows from motor to bus

f) reactive power flows from bus to motor

From the above statements, which of them are correct :

A) (a), (b), (d)

B) (c), (d), (e) - **(Correct Answer)**

C) (b), (d), (e)

D) (a), (b), (d), (f)

17. A long line rated 100 MVA, 400 kV has ABCD constants as below :

$\mathbf{A = D = 0.8 \leq 5^{\circ}; B = 10\underline{40^{\circ}}; C = 0.00190^{\circ}}$.

If receiving end voltage at no load is 400 kV, then sending end voltage is ___ .

A) 320 ∠5° kV — **(Correct Answer)**

B) 320 ∠−5° kV

C) 400 ∠5° kV

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D) 500 ∠−5° kV

18. A 200 m radial line AB with resistance 0.2Ω/km (go and return) is loaded with 100 A at end B and 100 A at mid point C. If voltage at sending end A is 200 V , then voltage at mid point C is :

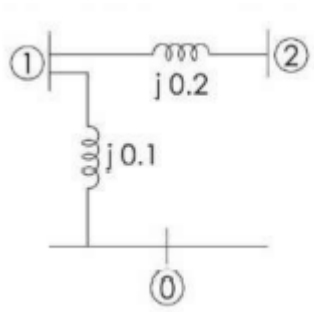
A) 198 V

B) 196 V - **(Correct Answer)**

C) 202 V

D) 197.5 V

19. Bus impedance matrix for the network shown below is ___ . pu impedance values are given.



A) ZBUS = [j0.1 j0.2
j0.2 j0.3]

B) ZBUS = [j0.1 j0.1
j0.1 j0.3] — **(Correct Answer)**

C) ZBUS = [j0.3 −j0.2
−j0.2 j0.2]

D) ZBUS = [j0.3 −j0.2
−j0.2 j0.3]

20. The single phase line of 230 V and a three phase line of 400 V which feed different domestic circuits and industrial loads represent :

A) Primary distribution

B) Secondary distribution - **(Correct Answer)**

C) Secondary transmission

D) Primary subtransmission

21. A 50 Hz, 4 pole turbo alternator rated at 20 MVA, 13.2 kV has an inertia

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constant H = 4 kW/kVA. The kinetic energy stored in the rotor at :

A) 10 MJ

B) 80 MJ - **(Correct Answer)**

C) 40 MJ

D) 20 MJ

22. A 16 stage impulse voltage generator has stage capacitance of 0.125μ F and a charging voltage of 200 kV . The energy rating in kJ is :

A) 40 - **(Correct Answer)**

B) 50

C) 80

D) 640

23. The steady state stability of the power system can be increased by :

A) Using machines of high impedance

B) Reducing the excitation of the machines

C) Connecting lines in series

D) Connecting lines in parallel - **(Correct Answer)**

24. A lightning arrester connected the line and earth in a power system :

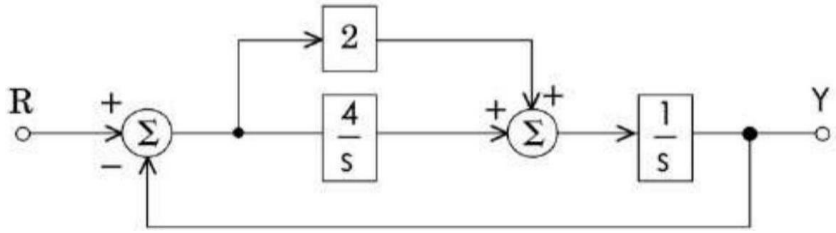
A) Protects the terminal equipment against the travelling circuits - **(Correct Answer)**

B) Protects the transmission line against direct lightning stroke

C) Suppresses high frequency oscillations in the line

D) Reflects back the travelling wave approaching it

25. The transfer function of the Block diagram is :



A) $\frac{s+2}{s^2+2s+4}$

B) $\frac{2s+2}{s^2+s+2}$

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C) $\frac{2s+4}{s^2+s+2}$

D) $\frac{2s+4}{s^2+2s+4}$ – **(Correct Answer)**

26. The open-loop transfer function of a unity feedback control system is :

$\boldsymbol{G(s)H(s) = \frac{10}{s(s+2)(s+K)}}$

Here K is a Variable parameter. The system will be stable for all values of :

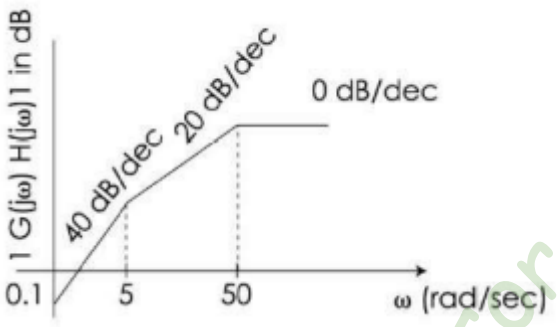
$A: K > 0$

B) K > −2

C) K > -1.55

D) K > 1.45 - **(Correct Answer)**

27. The open-loop transfer function for the Bode's magnitude plot is :



A) G(s) H(s) = K / [s²(1 + 0.2s)(1 + 0.02s)]

B) G(s) H(s) = Ks / [(1 + 0.2s)(1 + 0.02s)]

C) G(s) H(s) = Ks² / [(s + 5)(s + 50)] — **(Correct Answer)**

D) G(s) H(s) = K / [s²(s + 5)(s + 50)]

28. A phase - lead network has its transfer function $\boldsymbol{G_c(s) = \frac{(1+0.04s)}{(1+0.01s)}}$ what is the frequency at which the maximum phase-lead occurs ?

A) 25 rad/sec

B) 50 rad/sec - **(Correct Answer)**

C) 75 rad/sec

D) 100 rad/sec

29. When high potential is to be measured using potentiometer ___ is used.

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A) a ratio box or a volt box - **(Correct Answer)**

B) a battery

C) a standard cell

D) a vibration galvanometer

30. In spring controlled moving iron instruments, the scale is :

A) uniform

B) cramped at the lower end and expanded at the upper end. - **(Correct Answer)**

C) expanded at the lower end and cramped at the upper end.

D) Cramped both at the lower and upper ends.

31. Electrical resonance type frequency meter's working is dependent upon :

A) Mechanical resonance

B) Electrical resonance - **(Correct Answer)**

C) Variation in current distribution

D) Variation in the current ratio

32. In a CRO, the component used to amplify the signal applied to the X-plates is :

A) Vertical amplifier

B) Horizontal amplifier - **(Correct Answer)**

C) Trigger circuit

D) Attenuator

33. Find the full scale output of a 4-bit DAC produces an output of 0.1 V for a digital input 0001.

A) 1.5 - **(Correct Answer)**

B) 1.6

C) 1.4

D) 1.2

34. What is the value of frequency of oscillation for an astable multivibrator has $C_1 = C_2 = 1000pF$ and $R_1 = R_2 = 20k\Omega$?

A) 50 kHz

B) 50 Hz

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C) 36.25 Hz

D) 36.25 kHz - **(Correct Answer)**

35. In 8085, the numbers 45H and 7EH are added. The resulting flag settings will be as follows.

A) Both CY and AC are set

B) CY set AC reset

C) CY reset AC set - **(Correct Answer)**

D) Both CY and AC reset

36. The number of address lines required for an 8 k -byte memory chip (8085) is :

A) 15

B) 13 - **(Correct Answer)**

C) 10

D) 18

37. What is the time required to deliver a charge of 200 Ah through a single-phase halfwave diode rectifier with an output current of 100 A rms and with sinusoidal input voltage :

A) 2 Hours

B) 3.14 Hours - **(Correct Answer)**

C) 6.28 Hours

D) 4 Hours

38. A chopper circuit is operating on TRC control mode at a frequency of 2 kHz of a 230 V dc supply. For output voltage of 170 V , the conduction and blocking periods of a thyristor in each cycle are respectively :

A) 0.386 ms and 0.114 ms

B) 0.369 ms and 0.131 ms - **(Correct Answer)**

C) 0.390 ms and 0.110 ms

D) 0.131 ms and 0.369 ms

39. An electric motor developing a starting torque of 15 N − m, starts with a load torque of 7 Nm on its shaft. If the acceleration at start is $2 rad/sec^2$, the moment of inertia of the system must be (neglecting viscous and coulomb friction)

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A) 0.25 kg – m^2

B) 0.25Nm^2

C) 4 kg – m^2 - **(Correct Answer)**

D) 4 N – m^2

40. What is the maximum output voltage of a three-phase bridge rectifier supplied with line voltage of 440 V ?

A) 528 V

B) 396 V

C) 594 V - **(Correct Answer)**

D) 616 V

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