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SET-Y

PHD-EE-2023-24

Electrical Engineering

10009

Sr. No. .....

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1. In PWM bipolar voltage switching scheme for single phase inverter. DC side have following components :

   (1) DC and sinusoidal components at twice the fundamental frequency

   (2) DC and sinusoidal components at twice the fundamental frequency

   (3) Pure DC only

   (4) None of the above

2. Kirchhoff's current law can be applied on :

   (1) Planer network

   (2) Non-planer network

   (3) All types of network

   (4) Neither planer nor non-planer

3. Eigen value of Hermitian matrix is :

   (1) Zero only

   (2) Imaginary

   (3) Real

   (4) Purely Imaginary or Zero

4. Divergence theorem of gauss discuss about transformation between :

   (1) Line integrals and Surface integrals

   (2) Volume integrals and Line integrals

   (3) Line integrals and Line integrals

   (4) Surface integrals and Volume integrals

5. For a single line to ground fault the zero-sequence current is given by j 3.0 *pu*. The current carried by the neutral during the fault is :

   (1) j 1.0 *pu*

   (2) j 3.0 *pu*

   (3) j 9.0 *pu*

   (4) j 6.0 *pu*

6. The emitter of the transistor is generally doped the heaviest because it :

(1) has to dissipate maximum power

(2) has to supply the charge carriers

(3) is the first region of transistor

(4) must possess low resistance

7. A JFET has disadvantage of :

(1) being noisy

(2) having small gain bandwidth product

(3) possessing positive temperature coefficient

(4) having low input impedance

8. Routh's stability criterion can be used for determining :

(1) System response for the disturbance

(2) Absolute and relative stability of the system

(3) Noise present in the system

(4) Transient and steady state response

9. Kelvin double bridge is best suited for the measurement of :

(1) Resistance of very low value (2) Low value capacitance

(3) Resistance of very high value (4) High value capacitance

10. In transformer, eddy current loss is 1000 watts which is half of the total core loss. If thickness of lamination and frequency by 10%, the new core losses are :

(1) 3200 W (2) 1000 W

(3) 2200 W (4) 2000 W

11. A Schottky diode is a :

(1) Majority carrier device

(2) Minority carrier device

(3) Fast a recovery diode

(4) Both a majority and minority carrier diode

12. Which logic family provide maximum power dissipation ?

(1) TTL (2) CMOS (3) ECL (4) JEET

13. DC machines have ..... windings and synchronous use ..... windings.

(1) Closed, open (2) Open, closed

(3) Open, open (4) Closed, closed

14. The per unit impedance of a circuit element is 0.15, if the base KV and base MVA are halved, then new value of the per unit impedance of the circuit element will be :

(1) 0.30 (2) 0.0075 (3) 0.600 (4) 0.15

15. Which of these sets of logic gates are designated as universal gates ?

(1) OR, AND (2) XOR, NOR, NAND

(3) NOR, NAND, XNOR (4) NOR, NAND

16. In the toggle mode a JK flip flop has :

(1) J = 1, K = 1 (2) J = 0, K = 1

(3) J = 1, K = 0 (4) J = 0, K = 0

17. A 100 μA ammeter has an internal resistance of 100 ohm. For extending its range to measure 500 μA, the shunt resistance required is of :

(1) 20.0 Ω (2) 22.22 Ω

(3) 25.0 Ω (4) 50.0 Ω

18. The high torque to weight ratio in an analogue indicating instruments indicates :

(1) High friction loss (2) Low friction loss

(3) Nothing as regards friction loss (4) None of the above

19. A 3-phase 400V, synchronous motor is providing load at 0.8 p.f. lagging. If the field current of the motor is continuously increased, then :

(1) Power factor increases and the decreases

(2) Power factor is not affected

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

20. A transmission line has a surge impedance of 400 Ω is connected with the cable having surge impedance of 40 Ω, a surge magnitude of 100 kV is travelling from the transmission line toward the cable. Find the incident current ?

(1) 100 A (2) 200 A (3) 250 A (4) 2500 A

21. A3-phase 440V, 50 Hz induction motor has 4% slip. The frequency of the rotor current will be :

(1) 5 Hz (2) 50 Hz (3) 25 Hz (4) 2 Hz

22. If the fault current is 2000 A the relay setting 50% and the CT ratio is 400/5, then the plug setting multiplier will be :

(1) 10 A (2) 25 A (3) 15 A (4) 50 A

23. A string insulator has 5 units. The voltage across the bottom most unit is 25% of the total voltage. The string efficiency is :

(1) 25% (2) 50% (3) 80% (4) 75%

24. Which is the following ***true*** for the bode plot ?

(1) Time response of the system for the step input

(2) It's a frequency

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

25. A 183-bus power system has 150 PQ buses and 32 PV buses. In the general case, to obtain the load flow solution using Newton Raphson method in polar coordinates, the minimum number of simultaneous equations to be solved is :

(1) 214 (2) 332 (3) 183 (4) 182

26. If the penalty factor of a plant is unity, its incremental transmission loss is :

(1) 1 (2) –1

(3) 0 (4) None of the above

27. The dielectric losses of an electrical system are 50 Watts. What will be the dielectric losses if the voltage of the system is doubled ?

(1) 50 Watts (2) 100 Watts

(3) 300 Watts (4) 200 Watts

28. The difference between sending end voltage and receiving end voltage of transmission line controls :

(1) Active power (2) Reactive power

(3) Frequency (4) None of these

29. To protect the power transformer (Y- Y, with neutral earthed) against fault, the current transformer will have :

(1) Delta-delta connection
(2) Delta-star connection
(3) Star-delta connection
(4) Star-star connection

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

(1) Using machines of high impedance
(2) Connecting line in series impedance
(3) Connecting lines in parallel
(4) Reducing the excitation of the machine

31. If the base kVA is 25,000 then a 5000 kVA alternator with 8% reactance will have :

(1) A 4% reactance
(2) A 40% reactance
(3) A 16% reactance
(4) A 20% reactance

32. Ferranti effect states that under certain conditions the sending end voltage is :

(1) Less than receiving end voltage
(2) Greater than receiving end voltage
(3) Equal to receiving end voltage
(4) Abnormally high

33. If the shunt admittance of the transmission line is neglected, the maximum power will occur when torque angle :

(1) 45°
(2) –90°
(3) 90°
(4) 180°

34. Four identical alternators each are rated for 20 MVA, 11 KV having a sub-transient of 16% are working in parallel. The short-circuit level at the bus bar is :

(1) 500 MVA
(2) 400 MVA
(3) 125 MVA
(4) 100 MVA

35. If the fault current is 2000A, the relay setting is 50% and CT ration is 400:5, then plug setting multiplier (PSM) will be :

(1) 15 (2) 20 (3) 12.5 (4) 10

36. Maximum power transfer capability of transmission line can be increased by :

(1) Parallel transmission lines

(2) Using series capacitance

(3) Using bundled conductors

(4) All of the above

37. A transmission line has a reactance of 1 *pu* is operating at $V_s = V_r = 1$ *pu*. The generator is connected at source end which delivering 0.5pu of active power ? Find the load angle :

(1) 35° (2) 30° (3) 32° (4) 45°

38. A network containing 100 buses in which 10 are the voltage control buses, 20 are the reactive power support bussed, 6 are the generator bi=uses and rest all are load buses. Find the size of the Jacobian matrix ?

(1) 162X162 (2) 163X163

(3) 160X160 (4) 164X164

39. Transmission lines are transposed to reduce :

(1) Skin effect

(2) Proximity effect

(3) Ferranti effect

(4) Interference with neighbouring communication

40. The generating station suitable to operate as peak load plant is :

(1) Nuclear power plant

(2) Thermal power plant

(3) Pumped storage power plant

(4) None of the above

41. Consider system with transfer function $G(s) = \dfrac{s+6}{(Ks^2 + s + 6)}$. Its damping ratio will be 0.5 when the value of K is :

(1) 2/6 (2) 3 (3) 1/6 (4) 6

42. If pole-zero cancellation occurs, the system will be :

(1) Un-controllable

(2) Un-observable

(3) Either controllable or observable

(4) Either un-controllable or un-observable

43. Consider the function $f(x) = x_1^2 + 2x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_2x_3 - 4x_3x_1$. The function is :

(1) Positive definite (2) Positive semi-definite

(3) Negative definite (4) Negative semi-definite

44. A synchronous motor is operating on no load at unity power factor. If the field current is increased, the power factor will become :

(1) Leading and the current will decrease

(2) Lagging and the current will increase

(3) Lagging and the current will decrease

(4) Leading and the current will increase

45. The Double edge modulation eliminates certain harmonics when the reference is :

(1) Sine wave (2) Square wave

(3) Triangular wave (4) Trapezoidal wave

46. In dual converter :

(1) Both rectifiers provide positive current to the load

(2) Both rectifiers provide negative current to the load

(3) One rectifier provides positive current to the load and the other negative current

(4) One rectifier provides positive current to the source and the other negative current to the load

47. In communication PAC stands for :

(1) Permanent angle converter

(2) Phase angle converter

(3) Phase angle communication

(4) Phase and commutation

48. A control system described by $\dot{x} = \begin{vmatrix} -4 & 1 \\ 2 & -3 \end{vmatrix} x + \begin{vmatrix} 2 \\ 3 \end{vmatrix} u, y = [3 \quad -2]x$. The system is to be controlled by control law $u = -Kx(t)$. The feedback matrix K for placing the poles at $-4 \pm j4$ is :

(1) $K = [-10 \quad 7]$ (2) $K = [-2 \quad 7]$

(3) $K = [2 \quad 7]$ (4) $K = [10 \quad 7]$

49. Consider the matrix $A = \begin{vmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{vmatrix}$. The eigen vectors of A are :

(1) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{28} \quad \frac{-46}{28}\right]'$

(2) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{35} \quad \frac{-46}{35}\right]'$

(3) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{42} \quad \frac{-46}{42}\right]'$

(4) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{49} \quad \frac{-46}{49}\right]'$

50. For what value of d, does the following system of linear equations has a non-trivial solution ?

$$(4d-1)x + y + z = 0$$
$$-y + z = 0$$
$$(4d-1)z = 0$$

(1) $\left(\frac{1}{2}\right)$

(2) $\left(\frac{3}{4}\right)$

(3) $\left(\frac{1}{4}\right)$

(4) 1

51. What is the correct representation of the probability distribution of a fair die that may provide an output of any number from 1 to 6 ?

(1) $p(x) = \frac{x}{6}$; $x = 0,1,....,6$

(2) $p(x) = \frac{1}{6}$; $x = 0,1,....,6$

(3) $p(x) = \int_a^b \frac{1}{6} dx$; $a = 1,....,6$

(4) $p(x) = \frac{1}{8}$; $x = 0, 1,....,8$

52. We wish to solve $x^2 - 2 = 0$ by Newton Rahson technique. If initial guess is $x_0 = 1.0$ subsequent estimate of x (i.e. x_1) will be :

(1) 1.414 (2) 2.0 (3) 1.5 (4) None of these

53. Determine the maxima and minima of the following function :

$$f(x) = x^3 - 6x^2 + 9x + 25$$

(1) Maxima at $x = 1$ and minima at $x = -3$

(2) Maxima at $x = 3$ and minima at $x = -1$

(3) Maxima at $x = 1$ and minima at $x = 4$

(4) Maxima at $x = 1$ and minima at $x = 3$

54. Find the particular solution of the following differential equation :

$$\ddot{y} + y = \sec(x)$$

(1) $\cos(x)\ln|\cos(x)| + x\sin(x)$

(2) $\sin(x)\ln|\cos(x)| + x\cos(x)$

(3) $\cos(x)\ln|\cot(x)| + x\tan(x)$

(4) $\sin(x)\ln|\cos(x)| + x\cot(x)$

55. Laplace transform of piece wise continuous function $f(t)$ with a period p is:

(1) $F(s) = \dfrac{1}{1+e^{-ps}} \int_0^p e^{-st} f(t)dt$

(2) $F(s) = \dfrac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t)dt$

(3) $F(s) = \dfrac{1}{1-e^{ps}} \int_0^p e^{-st} f(t)dt$

(4) $F(s) = \dfrac{1}{1+e^{-ps}} \int_0^p e^{-st} f(t)dt$

56. A fixed capacitor of reactance $-j0.02\ \Omega$ is connected in parallel across a series combination of a fixed inductor of reactance $j0.01\ \Omega$ and a variable resistance R. As R is varied from zero to infinity, the locus diagram of the admittance of this R-L-C circuit will be :

(1) A semi-circle of diameter j 100 and center at zero.

(2) A straight line inclined at an angle.

(3) A semi-circle of diameter j50 and center at zero.

(4) A straight line parallel to the x-axis.

57. The percentage resistance and percentage reactance of a 10 kVA, 400V/200V, 3-Phase transformer is 2% and 10 % respectively. If the constant losses in the machine are 1%. the maximum possible percentage efficiency of the transformer is :

(1) 98.32 (2) 97.25 (3) 96.85 (4) 96.12

58. A series R-L-C circuit when excited by a 10V sinusoidal voltage source of a variable frequency, exhibits resonance at 100 Hz and has a 3 dB bandwidth of 5 Hz. The voltage across the inductor L at resonance is :

(1) 10 V (2) 14.14 V (3) 7.07 V (4) 200 V

59. In the protection of transformers harmonic restraint is used to guard against :

(1) Magnetizing inrush current

(2) Unbalance operation

(3) Lightning

(4) Switching overvoltage

60. The RMS value of the current in a wire which carries a d.c. current of 10 A and a sinusoidal alternating current of peak value 20 A is :

(1) 10 A (2) 14.14 A (3) 15 A (4) 17.32 A

61. Which of the following is ***true*** ?

(1) A finite signal is always bounded

(2) A bounded signal always possesses finite energy

(3) A bounded signal is always zero outside the interval $[-t_0, t_0]$ for some t_0

(4) A bounded signal is always finite

62. A current of $-8+6\sqrt{2}\sin(\omega t+30^\circ)$ A is passed through three meters. They are a centre zero PMMC meter, a true RMS meter and a moving iron instrument. The respective readings (in A) will be :

(1) 8, 6, 10 (2) 8, 6, 8

(3) –8, 10, 10 (4) –8, 2, 2

63. A non-ideal voltage source *Vs* has an internal impedance of Z_s. If a purely resistive load is to be chosen that maximizes the power transferred to the load, its values must be :

(1) 0 (2) Real part of Z_s

(3) Magnitude of Z_s (4) Complex conjugate of Z_s

64. A unit step voltage is applied at $t = 0$ to a series RL circuit with zero initial conditions :

(1) It is possible for the current to be oscillatory.

(2) The voltage across the resistor at $t = 0^+$ is zero.

(3) The energy stored in inductor in the steady state is zero.

(4) The resistor current eventually falls to zero.

65. The core flux of a practical transformer with a resistive load :

(1) Is strictly constant with load variation

(2) Increases with linear load

(3) Increases as the square root of the load

(4) Decreases with increased load

66. The bridge method commonly used for finding mutual inductance is :

(1) Heaviside Campbell Bridge

(2) Schering Bridge

(3) De Sauty Bridge

(4) Wien Bridge

67. A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The total size of the memory system is :

(1) 16 kB (2) 32 kB (3) 48 kB (4) 64 kB

68. A differentiable non constant even function $x(t)$ has a derivative $y(t)$, and their respective Fourier Transforms are $X(\omega)$ and $Y(\omega)$. Which of the following statements is ***true*** ?

(1) $X(\omega)$ and $Y(\omega)$ are both real

(2) $X(\omega)$ is real and $Y(\omega)$ is imaginary

(3) $X(\omega)$ and $Y(\omega)$ are both imaginary

(4) $X(\omega)$ is imaginary and $Y(\omega)$ is real

69. A 3-phase, 50 Hz, 6 pole induction motor has a rotor resistance of 0.1 Ω and reactance of 0.92.Ω. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, the ratio of maximum torque to full load torque is :

(1) 1.567 (2) 1.712 (3) 1.948 (4) 2.134

70. In a microprocessor, the address of the next instruction to be executed, is stored in :

(1) Stack pointer

(2) Address latch

(3) Program counter

(4) General purpose register

71. An Op-Amp has an open-loop gain of 10^5 and an open-loop upper cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed loop gain of 100, then the new upper cut-off frequency is :

(1) 10 Hz (2) 100 Hz (3) 10 kHz (4) 100 kHz

72. Let $x(t)$ be a periodic signal with time period T, Let $y(t) = x(t - t_0) + x(t + t_0)$ for some t_0. The Fourier series coefficients of $y(t)$ are denoted by bk. If $b_k = 0$ for all odd k. Then t_0 can be equal to :

(1) $T/8$ (2) $T/4$ (3) $T/2$ (4) $2T$

73. A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency in kHz which is ***not*** valid is :

(1) 5 (2) 12 (3) 15 (4) 20

74. The resistance and reactance of a 100 kVA 11000/400 V, $\Delta - Y$ distribution transformer is 0.02 and 0.07 *pu* respectively. The phase impedance (in Ω) of the transformer referred to the primary is :

(1) 0.02 + j0.07 (2) 0.55 + j1.925

(3) 15.125 + j52.94 (4) 72.6 + j254.1

75. An op-amp having a slew rate of 62.8 V/μ sec is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoidal is 10 V, then the minimum frequency at which the slew rate limited distortion would set in the output is :

(1) 1 MHz (2) 6.28 MHz

(3) 10 MHz (4) 62.8 MHz

76. The *pu* parameters for a 500 MVA machine on its own base are :

Inertia, M = 20 *pu*; reactance, X = 2 *pu*. The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) 4, 0.4 (2) 100, 10 (3) 4, 10 (4) 100, 0.4

77. The increasing order of speed of data access for the following devices is :

(i) Cache Memory

(ii) CD-ROM

(iii) Dynamic RAM

(iv) Processor Registers

(v) Magnetic Tape

(1) (v), (ii), (iii), (iv), (i)

(2) (v), (ii), (iii), (i), (iv)

(3) (v), (iii), (ii), (iv), (i)

(4) (iv), (ii), (iii), (v), (i)

78. A source $v_s(t) = V\cos(100\pi t)$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load connected to the source has to extract the maximum power out of this source, its value in Ω should be :

(1) 3 (2) 4 (3) 5 (4) 7

79. The Laplace transform of a function $f(t)$ is $F(s) = \dfrac{5s^2 + 23s + 6}{s(s^2 + 2s + 2)}$. As $t \to \infty$, $f(t)$ approaches :

(1) 3 (2) 5 (3) 17/2 (4) ∞

80. Two wattmeters', which are connected to measure the total power on a three-phase system supplying a balanced load, read 10.5 kW and -2.5 kW, respectively. The total power and the power factor respectively, are :

(1) 13 kW, 0.334

(2) 13 kW, 0.684

(3) 13 kW, 0.52

(4) 8 kW, 0.52

81. Feedback control systems are :

(1) Insensitive to both forward and feedback path parameter changes

(2) Less sensitive to feedback path parameter changes than to forward path parameter changes

(3) Less sensitive to forward path parameter changes than to feedback path parameter changes

(4) Equally sensitive to forward and feedback path parameter changes

82. The unit impulse response of a unit feedback control system is given by $c(t) = -te^{-t} + 2e^{-t} (t \geq 0)$ the open loop transfer function is equal to :

(1) $\frac{s+1}{(s+2)^2}$ (2) $\frac{2s+1}{s^2}$

(3) $\frac{2s+1}{(s+1)^2}$ (4) $\frac{(s+1)}{s^2}$

83. The depletion region (or) space charge region (or) transition region in a semiconductor p-n junction diode has :

(1) Electrons and holes (2) Positive ions and electrons

(3) Positive and negative ions (4) Negative ions and holes

84. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1 is :

(1) 4 (2) 6 (3) 8 (4) 10

85. If an A. C. voltage wave is corrupted with an arbitrary number of harmonics, then the overall voltage waveform differs from its fundamental frequency component in terms of Inertia, $M = 20$ *pu*; reactance, $X = 2$ *pu* The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) Only the peak values (2) Only the rms values

(3) Only the average values (4) All of the above

86. The system represented by the input-output relationship $y(t) = \int_{\infty}^{5t} x(\tau)d\tau, t > 0$ is :

(1) Linear and causal

(2) Linear but not causal

(3) Causal but not linear

(4) Neither linear nor causal

87. A voltage waveform $v(t) = 12\ t^2$ is applied across a 1 H inductor for $t \geq 0$, with initial current through it being zero. The current through the inductor for $t \geq 0$ is given by :

(1) $12\ t$ (2) $24\ t$ (3) $12\ t^3$ (4) $4\ t^3$

88. A 10-bit A/D converter is used to digitize an analog signal in the 0 to 5V range. The maximum peak to peak ripple voltage that can be allowed in the DC supply voltage is :

(1) Nearly 100 mV

(2) Nearly 50 mV

(3) Nearly 25 mV

(4) Nearly 5 mV

89. A current impulse of 5 $\delta(t)$, is forced through a capacitor C. The voltage $v_c(t)$, across the capacitor is given by :

(1) $5t$

(2) $5u(t) - C$

(3) $\frac{5t}{C}$

(4) $\frac{5u(t)}{C}$

90. The graph of an electrical network has N nodes and B branches. The number of links L, with respect to the choice of a tree is given by :

(1) B – N + 1

(2) B + N

(3) N – B + 1

(4) N – 2B – 1

91. Power consumed by a balanced 3-phase 3 wire load is measured by two wattmeter method. The first wattmeter reads twice that of the second. Then the load impedance angle in radians is :

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{8}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{3}$

92. A switched mode power supply operating at 20 kHz to 100 kHz range uses as the main switching element :

(1) Thyristor
(2) MOSFET
(3) Triac
(4) UJT

93. The conductors of a 10 km long, single phase, two wire line are separated by a distance of 1.5 m. The diameter of each conductor is 1 cm. If the conductors are of copper, the inductance of the circuit is :

(1) 50 mH
(2) 45.3 mH
(3) 23.8 mH
(4) 19.6 mH

94. If $\overline{E}$ is the electric field intensity, $\nabla(\nabla \times \overline{E})$ is equal to :

(1) $\overline{E}$
(2) $|\overline{E}|$
(3) Null vector
(4) Zero

95. Consider a long, two wire line composed of solid round conductors. The radius of both conductors is 0.25 cm and the distance between their centres as l meters. If this distance is doubled, then the inductance per unit length :

(1) Doubles
(2) Halves
(3) Increases but does not double
(4) Decreases but does not halve

96. The conduction loss v/s device current characteristics of a power MOSFET is best approximated by :

(1) Parabola
(2) Straight Line
(3) Rectangular Hyperbola
(4) Exponentially decaying function

97. The typical ratio of latching current to holding current in a 20 thyristor is :

(1) 5 (2) 2 (3) 1 (4) 0.5

98. In a uniform electric field, field lines at equipotential surfaces :

(1) Are parallel to one another

(2) Intersect at 45°

(3) Intersect at 30°

(4) Are orthogonal

99. A hollow metallic sphere of radius r is kept at potential of 1 V. The total electric flux coming out of the concentric spherical surface of radius R ($> r$) is :

(1) $4\pi\epsilon_0 r$ (2) $4\pi\epsilon_0 r^2$

(3) $4\pi\epsilon_0 R$ (4) $4\pi\epsilon_0 R^2$

100. The sequence components of the fault current are as follows :

$I_{+ve} = j1.5\ pu,\ I_{-ve} = -j0.5\ pu,\ I_0 = -j1\ pu.$

The type of the fault in the system is :

(1) LG (2) LL (3) LLG (4) LLLG

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B

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PHD-EE-2023-24
Electrical Engineering

10002

Sr. No. .....

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1. Consider system with transfer function $G(s) = \frac{s+6}{(Ks^2+s+6)}$. Its damping ratio will be 0.5 when the value of K is :

(1) 2/6 (2) 3 (3) 1/6 (4) 6

2. If pole-zero cancellation occurs, the system will be :

(1) Un-controllable

(2) Un-observable

(3) Either controllable or observable

(4) Either un-controllable or un-observable

3. Consider the function $f(x) = x_1^2 + 2x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_2x_3 - 4x_3x_1$. The function is :

(1) Positive definite

(2) Positive semi-definite

(3) Negative definite

(4) Negative semi-definite

4. A synchronous motor is operating on no load at unity power factor. If the field current is increased, the power factor will become :

(1) Leading and the current will decrease

(2) Lagging and the current will increase

(3) Lagging and the current will decrease

(4) Leading and the current will increase

5. The Double edge modulation eliminates certain harmonics when the reference is :

(1) Sine wave (2) Square wave

(3) Triangular wave (4) Trapezoidal wave

6. In dual converter :

(1) Both rectifiers provide positive current to the load

(2) Both rectifiers provide negative current to the load

(3) One rectifier provides positive current to the load and the other negative current

(4) One rectifier provides positive current to the source and the other negative current to the load

7. In communication PAC stands for :

(1) Permanent angle converter (2) Phase angle converter

(3) Phase angle communication (4) Phase and commutation

8. A control system described by $\dot{x} = \begin{vmatrix} -4 & 1 \\ 2 & -3 \end{vmatrix} x + \begin{vmatrix} 2 \\ 3 \end{vmatrix} u, y = [3 \quad -2]x$. The system is to be controlled by control law $u = -Kx(t)$. The feedback matrix K for placing the poles at $-4 \pm j4$ is :

(1) $K = [-10 \ \ 7]$ (2) $K = [-2 \ \ 7]$ (3) $K = [2 \ \ 7]$ (4) $K = [10 \ \ 7]$

9. Consider the matrix $A = \begin{vmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{vmatrix}$. The eigen vectors of A are :

(1) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 \quad -\frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \quad \frac{-22}{28} \quad \frac{-46}{28}\right]'$

(2) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 \quad -\frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \quad \frac{-22}{35} \quad \frac{-46}{35}\right]'$

(3) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 \quad -\frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \quad \frac{-22}{42} \quad \frac{-46}{42}\right]'$

(4) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 \quad -\frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \quad \frac{-22}{49} \quad \frac{-46}{49}\right]'$

10. For what value of d, does the following system of linear equations has a non-trivial solution ?

$$(4d-1)x+y+z=0$$
$$-y+z=0$$
$$(4d-1)z=0$$

(1) $\left(\frac{1}{2}\right)$ (2) $\left(\frac{3}{4}\right)$

(3) $\left(\frac{1}{4}\right)$ (4) 1

11. An Op-Amp has an open-loop gain of 10^5 and an open-loop upper cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed loop gain of 100, then the new upper cut-off frequency is :

(1) 10 Hz (2) 100 Hz (3) 10 kHz (4) 100 kHz

12. Let $x(t)$ be a periodic signal with time period T, Let $y(t) = x(t - t_0) + x(t + t_0)$ for some t_0. The Fourier series coefficients of $y(t)$ are denoted by bk. If $b_k = 0$ for all odd k. Then t_0 can be equal to :

(1) $T/8$ (2) $T/4$ (3) $T/2$ (4) $2T$

13. A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency in kHz which is ***not*** valid is :

(1) 5 (2) 12 (3) 15 (4) 20

14. The resistance and reactance of a 100 kVA 11000/400 V, Δ – Y distribution transformer is 0.02 and 0.07 *pu* respectively. The phase impedance (in Ω) of the transformer referred to the primary is :

(1) 0.02 + j0.07 (2) 0.55 + j1.925

(3) 15.125 + j52.94 (4) 72.6 + j254.1

15. An op-amp having a slew rate of 62.8 V/μ sec is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoidal is 10 V, then the minimum frequency at which the slew rate limited distortion would set in the output is :

(1) 1 MHz
(2) 6.28 MHz
(3) 10 MHz
(4) 62.8 MHz

16. The *pu* parameters for a 500 MVA machine on its own base are :

Inertia, M = 20 *pu*; reactance, X = 2 *pu*. The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) 4, 0.4
(2) 100, 10
(3) 4, 10
(4) 100, 0.4

17. The increasing order of speed of data access for the following devices is :

(i) Cache Memory

(ii) CD-ROM

(iii) Dynamic RAM

(iv) Processor Registers

(v) Magnetic Tape

(1) (v), (ii), (iii), (iv), (i)

(2) (v), (ii), (iii), (i), (iv)

(3) (v), (iii), (ii), (iv), (i)

(4) (iv), (ii), (iii), (v), (i)

18. A source $v_s(t) = V\cos(100\pi t)$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load connected to the source has to extract the maximum power out of this source, its value in Ω should be :

(1) 3
(2) 4
(3) 5
(4) 7

19. The Laplace transform of a function $f(t)$ is $F(s)=\frac{5s^2+23s+6}{s(s^2+2s+2)}$. As $t \to \infty$, $f(t)$ approaches :

(1) 3 (2) 5 (3) 17/2 (4) ∞

20. Two wattmeters', which are connected to measure the total power on a three-phase system supplying a balanced load, read 10.5 kW and -2.5 kW, respectively. The total power and the power factor respectively, are :

(1) 13 kW, 0.334 (2) 13 kW, 0.684

(3) 13 kW, 0.52 (4) 8 kW, 0.52

21. Power consumed by a balanced 3-phase 3 wire load is measured by two wattmeter method. The first wattmeter reads twice that of the second. Then the load impedance angle in radians is :

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{8}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{3}$

22. A switched mode power supply operating at 20 kHz to 100 kHz range uses as the main switching element :

(1) Thyristor (2) MOSFET

(3) Triac (4) UJT

23. The conductors of a 10 km long, single phase, two wire line are separated by a distance of 1.5 m. The diameter of each conductor is 1 cm. If the conductors are of copper, the inductance of the circuit is :

(1) 50 mH (2) 45.3 mH

(3) 23.8 mH (4) 19.6 mH

24. If $\overline{E}$ is the electric field intensity, $\nabla(\nabla \times \overline{E})$ is equal to :

(1) $\overline{E}$ (2) $|\overline{E}|$ (3) Null vector (4) Zero

25. Consider a long, two wire line composed of solid round conductors. The radius of both conductors is 0.25 cm and the distance between their centres as l meters. If this distance is doubled, then the inductance per unit length :

(1) Doubles

(2) Halves

(3) Increases but does not double

(4) Decreases but does not halve

26. The conduction loss v/s device current characteristics of a power MOSFET is best approximated by :

(1) Parabola

(2) Straight Line

(3) Rectangular Hyperbola

(4) Exponentially decaying function

27. The typical ratio of latching current to holding current in a 20 thyristor is :

(1) 5 (2) 2 (3) 1 (4) 0.5

28. In a uniform electric field, field lines at equipotential surfaces :

(1) Are parallel to one another (2) Intersect at 45°

(3) Intersect at 30° (4) Are orthogonal

29. A hollow metallic sphere of radius r is kept at potential of 1 V. The total electric flux coming out of the concentric spherical surface of radius R ($> r$) is :

(1) $4\pi\epsilon_0 r$ (2) $4\pi\epsilon_0 r^2$

(3) $4\pi\epsilon_0 R$ (4) $4\pi\epsilon_0 R^2$

30. The sequence components of the fault current are as follows :

$I_{+ve} = j1.5\ pu,\ I_{-ve} = -j0.5\ pu,\ I_0 = -j1\ pu.$

The type of the fault in the system is :

(1) LG (2) LL (3) LLG (4) LLLG

31. In PWM bipolar voltage switching scheme for single phase inverter. DC side have following components :

(1) DC and sinusoidal components at twice the fundamental frequency

(2) DC and sinusoidal components at twice the fundamental frequency

(3) Pure DC only

(4) None of the above

32. Kirchhoff's current law can be applied on :

(1) Planer network (2) Non-planer network

(3) All types of network (4) Neither planer nor non-planer

33. Eigen value of Hermitian matrix is :

(1) Zero only (2) Imaginary

(3) Real (4) Purely Imaginary or Zero

34. Divergence theorem of gauss discuss about transformation between :

(1) Line integrals and Surface integrals

(2) Volume integrals and Line integrals

(3) Line integrals and Line integrals

(4) Surface integrals and Volume integrals

35. For a single line to ground fault the zero-sequence current is given by j 3.0 *pu*. The current carried by the neutral during the fault is :

(1) j 1.0 *pu*
(2) j 3.0 *pu*
(3) j 9.0 *pu*
(4) j 6.0 *pu*

36. The emitter of the transistor is generally doped the heaviest because it :

(1) has to dissipate maximum power
(2) has to supply the charge carriers
(3) is the first region of transistor
(4) must possess low resistance

37. A JFET has disadvantage of :

(1) being noisy
(2) having small gain bandwidth product
(3) possessing positive temperature coefficient
(4) having low input impedance

38. Routh's stability criterion can be used for determining :

(1) System response for the disturbance
(2) Absolute and relative stability of the system
(3) Noise present in the system
(4) Transient and steady state response

39. Kelvin double bridge is best suited for the measurement of :

(1) Resistance of very low value
(2) Low value capacitance
(3) Resistance of very high value
(4) High value capacitance

40. In transformer, eddy current loss is 1000 watts which is half of the total core loss. If thickness of lamination and frequency by 10%, the new core losses are :

(1) 3200 W (2) 1000 W

(3) 2200 W (4) 2000 W

41. What is the correct representation of the probability distribution of a fair die that may provide an output of any number from 1 to 6 ?

(1) $p(x)=\frac{x}{6};\ x=0,1,....,6$ (2) $p(x)=\frac{1}{6};\ x=0,1,....,6$

(3) $p(x)=\int_a^b \frac{1}{6}dx;\ a=1,....,6$ (4) $p(x)=\frac{1}{8};x=0,\ 1,....,8$

42. We wish to solve $x^2-2=0$ by Newton Rahson technique. If initial guess is $x_0=1.0$ subsequent estimate of x (i.e. x_1) will be :

(1) 1.414 (2) 2.0

(3) 1.5 (4) None of these

43. Determine the maxima and minima of the following function :

$$f(x)=x^3-6x^2+9x+25$$

(1) Maxima at $x = 1$ and minima at $x = -3$

(2) Maxima at $x = 3$ and minima at $x = -1$

(3) Maxima at $x = 1$ and minima at $x = 4$

(4) Maxima at $x = 1$ and minima at $x = 3$

44. Find the particular solution of the following differential equation :

$$\ddot{y} + y = \sec(x)$$

(1) $\cos(x)\ln|\cos(x)| + x\sin(x)$

(2) $\sin(x)\ln|\cos(x)| + x\cos(x)$

(3) $\cos(x)\ln|\cot(x)| + x\tan(x)$

(4) $\sin(x)\ln|\cos(x)| + x\cot(x)$

45. Laplace transform of piece wise continuous function $f(t)$ with a period p is:

(1) $F(s) = \dfrac{1}{1+e^{-ps}} \int_0^p e^{-st} f(t)dt$

(2) $F(s) = \dfrac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t)dt$

(3) $F(s) = \dfrac{1}{1-e^{ps}} \int_0^p e^{-st} f(t)dt$

(4) $F(s) = \dfrac{1}{1+e^{-ps}} \int_0^p e^{-st} f(t)dt$

46. A fixed capacitor of reactance –j0.02 Ω is connected in parallel across a series combination of a fixed inductor of reactance j0.01 Ω and a variable resistance R. As R is varied from zero to infinity, the locus diagram of the admittance of this R-L-C circuit will be :

(1) A semi-circle of diameter j 100 and center at zero.

(2) A straight line inclined at an angle.

(3) A semi-circle of diameter j50 and center at zero.

(4) A straight line parallel to the x-axis.

47. The percentage resistance and percentage reactance of a 10 kVA, 400V/200V, 3-Phase transformer is 2% and 10 % respectively. If the constant losses in the machine are 1%. the maximum possible percentage efficiency of the transformer is :

(1) 98.32 (2) 97.25 (3) 96.85 (4) 96.12

48. A series R-L-C circuit when excited by a 10V sinusoidal voltage source of a variable frequency, exhibits resonance at 100 Hz and has a 3 dB bandwidth of 5 Hz. The voltage across the inductor L at resonance is :

(1) 10 V (2) 14.14 V (3) 7.07 V (4) 200 V

49. In the protection of transformers harmonic restraint is used to guard against :

(1) Magnetizing inrush current

(2) Unbalance operation

(3) Lightning

(4) Switching overvoltage

50. The RMS value of the current in a wire which carries a d.c. current of 10 A and a sinusoidal alternating current of peak value 20 A is :

(1) 10 A (2) 14.14 A (3) 15 A (4) 17.32 A

51. Which of the following is ***true*** ?

(1) A finite signal is always bounded

(2) A bounded signal always possesses finite energy

(3) A bounded signal is always zero outside the interval $[-t_0, t_0]$ for some t_0

(4) A bounded signal is always finite

52. A current of $-8+6\sqrt{2}\sin(\omega t+30^\circ)$ A is passed through three meters. They are a centre zero PMMC meter, a true RMS meter and a moving iron instrument. The respective readings (in A) will be :

(1) 8, 6, 10
(2) 8, 6, 8
(3) –8, 10, 10
(4) –8, 2, 2

53. A non-ideal voltage source *Vs* has an internal impedance of Z_s. If a purely resistive load is to be chosen that maximizes the power transferred to the load, its values must be :

(1) 0
(2) Real part of Z_s
(3) Magnitude of Z_s
(4) Complex conjugate of Z_s

54. A unit step voltage is applied at $t = 0$ to a series RL circuit with zero initial conditions :

(1) It is possible for the current to be oscillatory.
(2) The voltage across the resistor at $t = 0^+$ is zero.
(3) The energy stored in inductor in the steady state is zero.
(4) The resistor current eventually falls to zero.

55. The core flux of a practical transformer with a resistive load :

(1) Is strictly constant with load variation
(2) Increases with linear load
(3) Increases as the square root of the load
(4) Decreases with increased load

56. The bridge method commonly used for finding mutual inductance is :

(1) Heaviside Campbell Bridge
(2) Schering Bridge
(3) De Sauty Bridge
(4) Wien Bridge

57. A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The total size of the memory system is :

(1) 16 kB (2) 32 kB (3) 48 kB (4) 64 kB

58. A differentiable non constant even function $x(t)$ has a derivative $y(t)$, and their respective Fourier Transforms are $X(\omega)$ and $Y(\omega)$. Which of the following statements is ***true*** ?

(1) $X(\omega)$ and $Y(\omega)$ are both real

(2) $X(\omega)$ is real and $Y(\omega)$ is imaginary

(3) $X(\omega)$ and $Y(\omega)$ are both imaginary

(4) $X(\omega)$ is imaginary and $Y(\omega)$ is real

59. A 3-phase, 50 Hz, 6 pole induction motor has a rotor resistance of 0.1 Ω and reactance of 0.92.Ω. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, the ratio of maximum torque to full load torque is :

(1) 1.567 (2) 1.712 (3) 1.948 (4) 2.134

60. In a microprocessor, the address of the next instruction to be executed, is stored in :

(1) Stack pointer (2) Address latch

(3) Program counter (4) General purpose register

61. A3-phase 440V, 50 Hz induction motor has 4% slip. The frequency of the rotor current will be :

(1) 5 Hz (2) 50 Hz (3) 25 Hz (4) 2 Hz

62. If the fault current is 2000 A the relay setting 50% and the CT ratio is 400/5, then the plug setting multiplier will be :

(1) 10 A (2) 25 A (3) 15 A (4) 50 A

63. A string insulator has 5 units. The voltage across the bottom most unit is 25% of the total voltage. The string efficiency is :

(1) 25% (2) 50% (3) 80% (4) 75%

64. Which is the following ***true*** for the bode plot ?

(1) Time response of the system for the step input

(2) It's a frequency

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

65. A 183-bus power system has 150 PQ buses and 32 PV buses. In the general case, to obtain the load flow solution using Newton Raphson method in polar coordinates, the minimum number of simultaneous equations to be solved is :

(1) 214 (2) 332 (3) 183 (4) 182

66. If the penalty factor of a plant is unity, its incremental transmission loss is :

(1) 1 (2) –1

(3) 0 (4) None of the above

67. The dielectric losses of an electrical system are 50 Watts. What will be the dielectric losses if the voltage of the system is doubled ?

(1) 50 Watts (2) 100 Watts

(3) 300 Watts (4) 200 Watts

68. The difference between sending end voltage and receiving end voltage of transmission line controls :

(1) Active power (2) Reactive power

(3) Frequency (4) None of these

69. To protect the power transformer (Y- Y, with neutral earthed) against fault, the current transformer will have :

(1) Delta-delta connection (2) Delta-star connection

(3) Star-delta connection (4) Star-star connection

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

(1) Using machines of high impedance

(2) Connecting line in series impedance

(3) Connecting lines in parallel

(4) Reducing the excitation of the machine

71. A Schottky diode is a :

(1) Majority carrier device

(2) Minority carrier device

(3) Fast a recovery diode

(4) Both a majority and minority carrier diode

72. Which logic family provide maximum power dissipation ?

(1) TTL (2) CMOS (3) ECL (4) JEET

73. DC machines have ..... windings and synchronous use ..... windings.

(1) Closed, open (2) Open, closed

(3) Open, open (4) Closed, closed

74. The per unit impedance of a circuit element is 0.15, if the base KV and base MVA are halved, then new value of the per unit impedance of the circuit element will be :

(1) 0.30 (2) 0.0075 (3) 0.600 (4) 0.15

75. Which of these sets of logic gates are designated as universal gates ?

(1) OR, AND

(2) XOR, NOR, NAND

(3) NOR, NAND, XNOR

(4) NOR, NAND

76. In the toggle mode a JK flip flop has :

(1) J = 1, K = 1

(2) J = 0, K = 1

(3) J = 1, K = 0

(4) J = 0, K = 0

77. A 100 μA ammeter has an internal resistance of 100 ohm. For extending its range to measure 500 μA, the shunt resistance required is of :

(1) 20.0 Ω

(2) 22.22 Ω

(3) 25.0 Ω

(4) 50.0 Ω

78. The high torque to weight ratio in an analogue indicating instruments indicates :

(1) High friction loss

(2) Low friction loss

(3) Nothing as regards friction loss

(4) None of the above

79. A 3-phase 400V, synchronous motor is providing load at 0.8 p.f. lagging. If the field current of the motor is continuously increased, then :

(1) Power factor increases and the decreases

(2) Power factor is not affected

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

80. A transmission line has a surge impedance of 400 Ω is connected with the cable having surge impedance of 40 Ω, a surge magnitude of 100 kV is travelling from the transmission line toward the cable. Find the incident current ?

(1) 100 A (2) 200 A (3) 250 A (4) 2500 A

81. Feedback control systems are :

(1) Insensitive to both forward and feedback path parameter changes

(2) Less sensitive to feedback path parameter changes than to forward path parameter changes

(3) Less sensitive to forward path parameter changes than to feedback path parameter changes

(4) Equally sensitive to forward and feedback path parameter changes

82. The unit impulse response of a unit feedback control system is given by $c(t) = -te^{-t} + 2e^{-t} (t \geq 0)$ the open loop transfer function is equal to :

(1) $\frac{s+1}{(s+2)^2}$ (2) $\frac{2s+1}{s^2}$

(3) $\frac{2s+1}{(s+1)^2}$ (4) $\frac{(s+1)}{s^2}$

83. The depletion region (or) space charge region (or) transition region in a semiconductor p-n junction diode has :

(1) Electrons and holes (2) Positive ions and electrons

(3) Positive and negative ions (4) Negative ions and holes

84. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1 is :

(1) 4 (2) 6 (3) 8 (4) 10

85. If an A. C. voltage wave is corrupted with an arbitrary number of harmonics, then the overall voltage waveform differs from its fundamental frequency component in terms of Inertia, $M = 20\ pu$; reactance, $X = 2\ pu$ The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) Only the peak values
(2) Only the rms values
(3) Only the average values
(4) All of the above

86. The system represented by the input-output relationship $y(t) = \int_{\infty}^{5t} x(\tau)d\tau, t > 0$ is :

(1) Linear and causal
(2) Linear but not causal
(3) Causal but not linear
(4) Neither linear nor causal

87. A voltage waveform $v(t) = 12\ t^2$ is applied across a 1 H inductor for $t \geq 0$, with initial current through it being zero. The current through the inductor for $t \geq 0$ is given by :

(1) $12\ t$
(2) $24\ t$
(3) $12\ t^3$
(4) $4\ t^3$

88. A 10-bit A/D converter is used to digitize an analog signal in the 0 to 5V range. The maximum peak to peak ripple voltage that can be allowed in the DC supply voltage is :

(1) Nearly 100 mV
(2) Nearly 50 mV
(3) Nearly 25 mV
(4) Nearly 5 mV

89. A current impulse of 5 $\delta(t)$, is forced through a capacitor C. The voltage $v_c(t)$, across the capacitor is given by :

(1) $5t$
(2) $5u(t) - C$
(3) $\frac{5t}{C}$
(4) $\frac{5u(t)}{C}$

90. The graph of an electrical network has N nodes and B branches. The number of links L, with respect to the choice of a tree is given by :

(1) B – N + 1
(2) B + N
(3) N – B + 1
(4) N – 2B – 1

91. If the base kVA is 25,000 then a 5000 kVA alternator with 8% reactance will have :

(1) A 4% reactance (2) A 40% reactance

(3) A 16% reactance (4) A 20% reactance

92. Ferranti effect states that under certain conditions the sending end voltage is :

(1) Less than receiving end voltage

(2) Greater than receiving end voltage

(3) Equal to receiving end voltage

(4) Abnormally high

93. If the shunt admittance of the transmission line is neglected, the maximum power will occur when torque angle :

(1) 45° (2) –90° (3) 90° (4) 180°

94. Four identical alternators each are rated for 20 MVA, 11 KV having a sub-transient of 16% are working in parallel. The short-circuit level at the bus bar is :

(1) 500 MVA (2) 400 MVA

(3) 125 MVA (4) 100 MVA

95. If the fault current is 2000A, the relay setting is 50% and CT ration is 400:5, then plug setting multiplier (PSM) will be :

(1) 15 (2) 20 (3) 12.5 (4) 10

96. Maximum power transfer capability of transmission line can be increased by :

(1) Parallel transmission lines

(2) Using series capacitance

(3) Using bundled conductors

(4) All of the above

97. A transmission line has a reactance of 1 *pu* is operating at $V_s = V_r = 1$ *pu*. The generator is connected at source end which delivering 0.5pu of active power ? Find the load angle :

(1) 35° (2) 30° (3) 32° (4) 45°

98. A network containing 100 buses in which 10 are the voltage control buses, 20 are the reactive power support bussed, 6 are the generator bi=uses and rest all are load buses. Find the size of the Jacobian matrix ?

(1) 162X162 (2) 163X163

(3) 160X160 (4) 164X164

99. Transmission lines are transposed to reduce :

(1) Skin effect

(2) Proximity effect

(3) Ferranti effect

(4) Interference with neighbouring communication

100. The generating station suitable to operate as peak load plant is :

(1) Nuclear power plant

(2) Thermal power plant

(3) Pumped storage power plant

(4) None of the above

Total No. of Printed Pages : 21

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C

SET-Y

PHD-EE-2023-24

Electrical Engineering

Sr. No. 10003

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

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Date of Examination_____

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1. A3-phase 440V, 50 Hz induction motor has 4% slip. The frequency of the rotor current will be :

(1) 5 Hz (2) 50 Hz (3) 25 Hz (4) 2 Hz

2. If the fault current is 2000 A the relay setting 50% and the CT ratio is 400/5, then the plug setting multiplier will be :

(1) 10 A (2) 25 A (3) 15 A (4) 50 A

3. A string insulator has 5 units. The voltage across the bottom most unit is 25% of the total voltage. The string efficiency is :

(1) 25% (2) 50% (3) 80% (4) 75%

4. Which is the following ***true*** for the bode plot ?

(1) Time response of the system for the step input

(2) It's a frequency

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

5. A 183-bus power system has 150 PQ buses and 32 PV buses. In the general case, to obtain the load flow solution using Newton Raphson method in polar coordinates, the minimum number of simultaneous equations to be solved is :

(1) 214 (2) 332 (3) 183 (4) 182

6. If the penalty factor of a plant is unity, its incremental transmission loss is :

(1) 1 (2) –1

(3) 0 (4) None of the above

7. The dielectric losses of an electrical system are 50 Watts. What will be the dielectric losses if the voltage of the system is doubled ?

(1) 50 Watts (2) 100 Watts

(3) 300 Watts (4) 200 Watts

8. The difference between sending end voltage and receiving end voltage of transmission line controls :

(1) Active power (2) Reactive power

(3) Frequency (4) None of these

9. To protect the power transformer (Y- Y, with neutral earthed) against fault, the current transformer will have :

(1) Delta-delta connection (2) Delta-star connection

(3) Star-delta connection (4) Star-star connection

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

(1) Using machines of high impedance

(2) Connecting line in series impedance

(3) Connecting lines in parallel

(4) Reducing the excitation of the machine

11. What is the correct representation of the probability distribution of a fair die that may provide an output of any number from 1 to 6 ?

(1) $p(x) = \frac{x}{6}; x = 0,1,....,6$ (2) $p(x) = \frac{1}{6}; x = 0,1,....,6$

(3) $p(x) = \int_a^b \frac{1}{6} dx; a = 1,....,6$ (4) $p(x) = \frac{1}{8}; x = 0, 1,....,8$

12. We wish to solve $x^2 - 2 = 0$ by Newton Rahson technique. If initial guess is $x_0 = 1.0$ subsequent estimate of x (i.e. x_1) will be :

(1) 1.414 (2) 2.0 (3) 1.5 (4) None of these

13. Determine the maxima and minima of the following function :

$$f(x) = x^3 - 6x^2 + 9x + 25$$

(1) Maxima at $x = 1$ and minima at $x = -3$

(2) Maxima at $x = 3$ and minima at $x = -1$

(3) Maxima at $x = 1$ and minima at $x = 4$

(4) Maxima at $x = 1$ and minima at $x = 3$

14. Find the particular solution of the following differential equation :

$$\ddot{y} + y = \sec(x)$$

(1) $\cos(x)\ln|\cos(x)| + x\sin(x)$

(2) $\sin(x)\ln|\cos(x)| + x\cos(x)$

(3) $\cos(x)\ln|\cot(x)| + x\tan(x)$

(4) $\sin(x)\ln|\cos(x)| + x\cot(x)$

15. Laplace transform of piece wise continuous function $f(t)$ with a period p is:

(1) $F(s) = \dfrac{1}{1+e^{-ps}} \int_0^p e^{-st} f(t)dt$

(2) $F(s) = \dfrac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t)dt$

(3) $F(s) = \dfrac{1}{1-e^{ps}} \int_0^p e^{-st} f(t)dt$

(4) $F(s) = \dfrac{1}{1+e^{-ps}} \int_0^p e^{-st} f(t)dt$

16. A fixed capacitor of reactance –j0.02 Ω is connected in parallel across a series combination of a fixed inductor of reactance j0.01 Ω and a variable resistance R. As R is varied from zero to infinity, the locus diagram of the admittance of this R-L-C circuit will be :

(1) A semi-circle of diameter j 100 and center at zero.

(2) A straight line inclined at an angle.

(3) A semi-circle of diameter j50 and center at zero.

(4) A straight line parallel to the x-axis.

17. The percentage resistance and percentage reactance of a 10 kVA, 400V/200V, 3-Phase transformer is 2% and 10 % respectively. If the constant losses in the machine are 1%. the maximum possible percentage efficiency of the transformer is :

(1) 98.32 (2) 97.25 (3) 96.85 (4) 96.12

18. A series R-L-C circuit when excited by a 10V sinusoidal voltage source of a variable frequency, exhibits resonance at 100 Hz and has a 3 dB bandwidth of 5 Hz. The voltage across the inductor L at resonance is :

(1) 10 V (2) 14.14 V (3) 7.07 V (4) 200 V

19. In the protection of transformers harmonic restraint is used to guard against :

(1) Magnetizing inrush current

(2) Unbalance operation

(3) Lightning

(4) Switching overvoltage

20. The RMS value of the current in a wire which carries a d.c. current of 10 A and a sinusoidal alternating current of peak value 20 A is :

(1) 10 A (2) 14.14 A (3) 15 A (4) 17.32 A

21. Feedback control systems are :

(1) Insensitive to both forward and feedback path parameter changes

(2) Less sensitive to feedback path parameter changes than to forward path parameter changes

(3) Less sensitive to forward path parameter changes than to feedback path parameter changes

(4) Equally sensitive to forward and feedback path parameter changes

22. The unit impulse response of a unit feedback control system is given by $c(t) = -te^{-t} + 2e^{-t} (t \geq 0)$ the open loop transfer function is equal to :

(1) $\frac{s+1}{(s+2)^2}$ (2) $\frac{2s+1}{s^2}$

(3) $\frac{2s+1}{(s+1)^2}$ (4) $\frac{(s+1)}{s^2}$

23. The depletion region (or) space charge region (or) transition region in a semiconductor p-n junction diode has :

(1) Electrons and holes (2) Positive ions and electrons

(3) Positive and negative ions (4) Negative ions and holes

24. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1 is :

(1) 4 (2) 6 (3) 8 (4) 10

25. If an A. C. voltage wave is corrupted with an arbitrary number of harmonics, then the overall voltage waveform differs from its fundamental frequency component in terms of Inertia, $M = 20$ *pu*; reactance, $X = 2$ *pu* The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) Only the peak values (2) Only the rms values

(3) Only the average values (4) All of the above

26. The system represented by the input-output relationship $y(t) = \int_{\infty}^{5t} x(\tau)d\tau, t > 0$ is :

(1) Linear and causal
(2) Linear but not causal
(3) Causal but not linear
(4) Neither linear nor causal

27. A voltage waveform $v(t) = 12\ t^2$ is applied across a 1 H inductor for $t \geq 0$, with initial current through it being zero. The current through the inductor for $t \geq 0$ is given by :

(1) $12\ t$ (2) $24\ t$ (3) $12\ t^3$ (4) $4\ t^3$

28. A 10-bit A/D converter is used to digitize an analog signal in the 0 to 5V range. The maximum peak to peak ripple voltage that can be allowed in the DC supply voltage is :

(1) Nearly 100 mV
(2) Nearly 50 mV
(3) Nearly 25 mV
(4) Nearly 5 mV

29. A current impulse of 5 $\delta(t)$, is forced through a capacitor C. The voltage $v_c(t)$, across the capacitor is given by :

(1) $5t$
(2) $5u(t) - C$
(3) $\frac{5t}{C}$
(4) $\frac{5u(t)}{C}$

30. The graph of an electrical network has N nodes and B branches. The number of links L, with respect to the choice of a tree is given by :

(1) B – N + 1
(2) B + N
(3) N – B + 1
(4) N – 2B – 1

31. An Op-Amp has an open-loop gain of 10^5 and an open-loop upper cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed loop gain of 100, then the new upper cut-off frequency is :

(1) 10 Hz
(2) 100 Hz
(3) 10 kHz
(4) 100 kHz

32. Let $x(t)$ be a periodic signal with time period T, Let $y(t) = x(t - t_0) + x(t + t_0)$ for some t_0. The Fourier series coefficients of $y(t)$ are denoted by bk. If $b_k = 0$ for all odd k. Then t_0 can be equal to :

(1) $T/8$ (2) $T/4$ (3) $T/2$ (4) $2T$

33. A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency in kHz which is ***not*** valid is :

(1) 5 (2) 12 (3) 15 (4) 20

34. The resistance and reactance of a 100 kVA 11000/400 V, $\Delta - Y$ distribution transformer is 0.02 and 0.07 *pu* respectively. The phase impedance (in Ω) of the transformer referred to the primary is :

(1) 0.02 + j0.07 (2) 0.55 + j1.925

(3) 15.125 + j52.94 (4) 72.6 + j254.1

35. An op-amp having a slew rate of 62.8 V/μ sec is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoidal is 10 V, then the minimum frequency at which the slew rate limited distortion would set in the output is :

(1) 1 MHz (2) 6.28 MHz

(3) 10 MHz (4) 62.8 MHz

36. The *pu* parameters for a 500 MVA machine on its own base are :

Inertia, M = 20 *pu*; reactance, X = 2 *pu*. The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) 4, 0.4 (2) 100, 10 (3) 4, 10 (4) 100, 0.4

37. The increasing order of speed of data access for the following devices is :

(i) Cache Memory

(ii) CD-ROM

(iii) Dynamic RAM

(iv) Processor Registers

(v) Magnetic Tape

(1) (v), (ii), (iii), (iv), (i)

(2) (v), (ii), (iii), (i), (iv)

(3) (v), (iii), (ii), (iv), (i)

(4) (iv), (ii), (iii), (v), (i)

38. A source $v_s(t) = V\cos(100\pi t)$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load connected to the source has to extract the maximum power out of this source, its value in Ω should be :

(1) 3 (2) 4 (3) 5 (4) 7

39. The Laplace transform of a function $f(t)$ is $F(s) = \dfrac{5s^2 + 23s + 6}{s(s^2 + 2s + 2)}$. As $t \to \infty$, $f(t)$ approaches :

(1) 3 (2) 5 (3) 17/2 (4) ∞

40. Two wattmeters', which are connected to measure the total power on a three-phase system supplying a balanced load, read 10.5 kW and -2.5 kW, respectively. The total power and the power factor respectively, are :

(1) 13 kW, 0.334 (2) 13 kW, 0.684

(3) 13 kW, 0.52 (4) 8 kW, 0.52

41. A Schottky diode is a :

(1) Majority carrier device

(2) Minority carrier device

(3) Fast a recovery diode

(4) Both a majority and minority carrier diode

42. Which logic family provide maximum power dissipation ?

(1) TTL (2) CMOS (3) ECL (4) JEET

43. DC machines have ..... windings and synchronous use ..... windings.

(1) Closed, open (2) Open, closed

(3) Open, open (4) Closed, closed

44. The per unit impedance of a circuit element is 0.15, if the base KV and base MVA are halved, then new value of the per unit impedance of the circuit element will be :

(1) 0.30 (2) 0.0075 (3) 0.600 (4) 0.15

45. Which of these sets of logic gates are designated as universal gates ?

(1) OR, AND (2) XOR, NOR, NAND

(3) NOR, NAND, XNOR (4) NOR, NAND

46. In the toggle mode a JK flip flop has :

(1) J = 1, K = 1 (2) J = 0, K = 1

(3) J = 1, K = 0 (4) J = 0, K = 0

47. A 100 μA ammeter has an internal resistance of 100 ohm. For extending its range to measure 500 μA, the shunt resistance required is of :

(1) 20.0 Ω (2) 22.22 Ω (3) 25.0 Ω (4) 50.0 Ω

48. The high torque to weight ratio in an analogue indicating instruments indicates :

(1) High friction loss (2) Low friction loss

(3) Nothing as regards friction loss (4) None of the above

49. A 3-phase 400V, synchronous motor is providing load at 0.8 p.f. lagging. If the field current of the motor is continuously increased, then :

(1) Power factor increases and the decreases

(2) Power factor is not affected

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

50. A transmission line has a surge impedance of 400 Ω is connected with the cable having surge impedance of 40 Ω, a surge magnitude of 100 kV is travelling from the transmission line toward the cable. Find the incident current ?

(1) 100 A (2) 200 A (3) 250 A (4) 2500 A

51. If the base kVA is 25,000 then a 5000 kVA alternator with 8% reactance will have :

(1) A 4% reactance (2) A 40% reactance

(3) A 16% reactance (4) A 20% reactance

52. Ferranti effect states that under certain conditions the sending end voltage is :

(1) Less than receiving end voltage

(2) Greater than receiving end voltage

(3) Equal to receiving end voltage

(4) Abnormally high

53. If the shunt admittance of the transmission line is neglected, the maximum power will occur when torque angle :

(1) 45° (2) –90° (3) 90° (4) 180°

54. Four identical alternators each are rated for 20 MVA, 11 KV having a sub-transient of 16% are working in parallel. The short-circuit level at the bus bar is :

(1) 500 MVA (2) 400 MVA

(3) 125 MVA (4) 100 MVA

55. If the fault current is 2000A, the relay setting is 50% and CT ration is 400:5, then plug setting multiplier (PSM) will be :

(1) 15 (2) 20 (3) 12.5 (4) 10

56. Maximum power transfer capability of transmission line can be increased by :

(1) Parallel transmission lines

(2) Using series capacitance

(3) Using bundled conductors

(4) All of the above

57. A transmission line has a reactance of 1 *pu* is operating at $V_s = V_r = 1$ *pu*. The generator is connected at source end which delivering 0.5pu of active power ? Find the load angle :

(1) 35° (2) 30° (3) 32° (4) 45°

58. A network containing 100 buses in which 10 are the voltage control buses, 20 are the reactive power support bussed, 6 are the generator bi=uses and rest all are load buses. Find the size of the Jacobian matrix ?

(1) 162X162 (2) 163X163

(3) 160X160 (4) 164X164

59. Transmission lines are transposed to reduce :

(1) Skin effect

(2) Proximity effect

(3) Ferranti effect

(4) Interference with neighbouring communication

60. The generating station suitable to operate as peak load plant is :

(1) Nuclear power plant

(2) Thermal power plant

(3) Pumped storage power plant

(4) None of the above

61. In PWM bipolar voltage switching scheme for single phase inverter. DC side have following components :

(1) DC and sinusoidal components at twice the fundamental frequency

(2) DC and sinusoidal components at twice the fundamental frequency

(3) Pure DC only

(4) None of the above

62. Kirchhoff's current law can be applied on :

(1) Planer network

(2) Non-planer network

(3) All types of network

(4) Neither planer nor non-planer

63. Eigen value of Hermitian matrix is :

(1) Zero only

(2) Imaginary

(3) Real

(4) Purely Imaginary or Zero

64. Divergence theorem of gauss discuss about transformation between :

(1) Line integrals and Surface integrals

(2) Volume integrals and Line integrals

(3) Line integrals and Line integrals

(4) Surface integrals and Volume integrals

65. For a single line to ground fault the zero-sequence current is given by j 3.0 *pu*. The current carried by the neutral during the fault is :

(1) j 1.0 *pu* (2) j 3.0 *pu*

(3) j 9.0 *pu* (4) j 6.0 *pu*

66. The emitter of the transistor is generally doped the heaviest because it :

(1) has to dissipate maximum power

(2) has to supply the charge carriers

(3) is the first region of transistor

(4) must possess low resistance

67. A JFET has disadvantage of :

(1) being noisy

(2) having small gain bandwidth product

(3) possessing positive temperature coefficient

(4) having low input impedance

68. Routh's stability criterion can be used for determining :

(1) System response for the disturbance

(2) Absolute and relative stability of the system

(3) Noise present in the system

(4) Transient and steady state response

69. Kelvin double bridge is best suited for the measurement of :

(1) Resistance of very low value

(2) Low value capacitance

(3) Resistance of very high value

(4) High value capacitance

70. In transformer, eddy current loss is 1000 watts which is half of the total core loss. If thickness of lamination and frequency by 10%, the new core losses are :

(1) 3200 W (2) 1000 W

(3) 2200 W (4) 2000 W

71. Consider system with transfer function $G(s) = \frac{s+6}{(Ks^2+s+6)}$. Its damping ratio will be 0.5 when the value of K is :

(1) 2/6 (2) 3 (3) 1/6 (4) 6

72. If pole-zero cancellation occurs, the system will be :

(1) Un-controllable

(2) Un-observable

(3) Either controllable or observable

(4) Either un-controllable or un-observable

73. Consider the function $f(x) = x_1^2 + 2x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_2x_3 - 4x_3x_1$. The function is :

(1) Positive definite (2) Positive semi-definite

(3) Negative definite (4) Negative semi-definite

74. A synchronous motor is operating on no load at unity power factor. If the field current is increased, the power factor will become :

(1) Leading and the current will decrease

(2) Lagging and the current will increase

(3) Lagging and the current will decrease

(4) Leading and the current will increase

75. The Double edge modulation eliminates certain harmonics when the reference is :

(1) Sine wave (2) Square wave

(3) Triangular wave (4) Trapezoidal wave

76. In dual converter :

(1) Both rectifiers provide positive current to the load

(2) Both rectifiers provide negative current to the load

(3) One rectifier provides positive current to the load and the other negative current

(4) One rectifier provides positive current to the source and the other negative current to the load

77. In communication PAC stands for :

(1) Permanent angle converter

(2) Phase angle converter

(3) Phase angle communication

(4) Phase and commutation

78. A control system described by $\dot{x} = \begin{vmatrix} -4 & 1 \\ 2 & -3 \end{vmatrix} x + \begin{vmatrix} 2 \\ 3 \end{vmatrix} u, y = [3 \quad -2]x$. The system is to be controlled by control law $u = -Kx(t)$. The feedback matrix K for placing the poles at $-4 \pm j4$ is :

(1) $K = [-10 \quad 7]$

(2) $K = [-2 \quad 7]$

(3) $K = [2 \quad 7]$

(4) $K = [10 \quad 7]$

79. Consider the matrix $A = \begin{vmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{vmatrix}$. The eigen vectors of A are :

(1) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{28} \quad \frac{-46}{28}\right]'$

(2) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{35} \quad \frac{-46}{35}\right]'$

(3) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{42} \quad \frac{-46}{42}\right]'$

(4) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \quad \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{49} \quad \frac{-46}{49}\right]'$

80. For what value of d, does the following system of linear equations has a non-trivial solution ?

$$(4d-1)x + y + z = 0$$
$$-y + z = 0$$
$$(4d-1)z = 0$$

(1) $\left(\frac{1}{2}\right)$

(2) $\left(\frac{3}{4}\right)$

(3) $\left(\frac{1}{4}\right)$

(4) 1

81. Power consumed by a balanced 3-phase 3 wire load is measured by two wattmeter method. The first wattmeter reads twice that of the second. Then the load impedance angle in radians is :

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{8}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{3}$

82. A switched mode power supply operating at 20 kHz to 100 kHz range uses as the main switching element :

(1) Thyristor (2) MOSFET

(3) Triac (4) UJT

83. The conductors of a 10 km long, single phase, two wire line are separated by a distance of 1.5 m. The diameter of each conductor is 1 cm. If the conductors are of copper, the inductance of the circuit is :

(1) 50 mH (2) 45.3 mH

(3) 23.8 mH (4) 19.6 mH

84. If $\overline{E}$ is the electric field intensity, $\nabla(\nabla \times \overline{E})$ is equal to :

(1) $\overline{E}$ (2) $|\overline{E}|$

(3) Null vector (4) Zero

85. Consider a long, two wire line composed of solid round conductors. The radius of both conductors is 0.25 cm and the distance between their centres as l meters. If this distance is doubled, then the inductance per unit length :

(1) Doubles

(2) Halves

(3) Increases but does not double

(4) Decreases but does not halve

86. The conduction loss v/s device current characteristics of a power MOSFET is best approximated by :

(1) Parabola

(2) Straight Line

(3) Rectangular Hyperbola

(4) Exponentially decaying function

87. The typical ratio of latching current to holding current in a 20 thyristor is :

(1) 5 (2) 2 (3) 1 (4) 0.5

88. In a uniform electric field, field lines at equipotential surfaces :

(1) Are parallel to one another

(2) Intersect at 45°

(3) Intersect at 30°

(4) Are orthogonal

89. A hollow metallic sphere of radius r is kept at potential of 1 V. The total electric flux coming out of the concentric spherical surface of radius R ($> r$) is :

(1) $4\pi\epsilon_0 r$ (2) $4\pi\epsilon_0 r^2$

(3) $4\pi\epsilon_0 R$ (4) $4\pi\epsilon_0 R^2$

90. The sequence components of the fault current are as follows :

$I_{+ve} = j1.5\ pu,\ I_{-ve} = -j0.5\ pu,\ I_0 = -j1\ pu.$

The type of the fault in the system is :

(1) LG (2) LL (3) LLG (4) LLLG

91. Which of the following is ***true*** ?

(1) A finite signal is always bounded

(2) A bounded signal always possesses finite energy

(3) A bounded signal is always zero outside the interval $[-t_0, t_0]$ for some t_0

(4) A bounded signal is always finite

92. A current of $-8+6\sqrt{2}\sin(\omega t+30^\circ)$ A is passed through three meters. They are a centre zero PMMC meter, a true RMS meter and a moving iron instrument. The respective readings (in A) will be :

(1) 8, 6, 10

(2) 8, 6, 8

(3) –8, 10, 10

(4) –8, 2, 2

93. A non-ideal voltage source *Vs* has an internal impedance of Z_s. If a purely resistive load is to be chosen that maximizes the power transferred to the load, its values must be :

(1) 0

(2) Real part of Z_s

(3) Magnitude of Z_s

(4) Complex conjugate of Z_s

94. A unit step voltage is applied at $t = 0$ to a series RL circuit with zero initial conditions :

(1) It is possible for the current to be oscillatory.

(2) The voltage across the resistor at $t = 0^+$ is zero.

(3) The energy stored in inductor in the steady state is zero.

(4) The resistor current eventually falls to zero.

95. The core flux of a practical transformer with a resistive load :

(1) Is strictly constant with load variation

(2) Increases with linear load

(3) Increases as the square root of the load

(4) Decreases with increased load

96. The bridge method commonly used for finding mutual inductance is :

(1) Heaviside Campbell Bridge

(2) Schering Bridge

(3) De Sauty Bridge

(4) Wien Bridge

97. A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The total size of the memory system is :

(1) 16 kB (2) 32 kB (3) 48 kB (4) 64 kB

98. A differentiable non constant even function $x(t)$ has a derivative $y(t)$, and their respective Fourier Transforms are $X(\omega)$ and $Y(\omega)$. Which of the following statements is ***true*** ?

(1) $X(\omega)$ and $Y(\omega)$ are both real

(2) $X(\omega)$ is real and $Y(\omega)$ is imaginary

(3) $X(\omega)$ and $Y(\omega)$ are both imaginary

(4) $X(\omega)$ is imaginary and $Y(\omega)$ is real

99. A 3-phase, 50 Hz, 6 pole induction motor has a rotor resistance of 0.1 Ω and reactance of 0.92.Ω. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, the ratio of maximum torque to full load torque is :

(1) 1.567 (2) 1.712 (3) 1.948 (4) 2.134

100. In a microprocessor, the address of the next instruction to be executed, is stored in :

(1) Stack pointer (2) Address latch

(3) Program counter (4) General purpose register

Total No. of Printed Pages : 21

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Electrical Engineering

10012

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

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1. Power consumed by a balanced 3-phase 3 wire load is measured by two wattmeter method. The first wattmeter reads twice that of the second. Then the load impedance angle in radians is :

(1) $\frac{\pi}{12}$ (2) $\frac{\pi}{8}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{3}$

2. A switched mode power supply operating at 20 kHz to 100 kHz range uses as the main switching element :

(1) Thyristor (2) MOSFET

(3) Triac (4) UJT

3. The conductors of a 10 km long, single phase, two wire line are separated by a distance of 1.5 m. The diameter of each conductor is 1 cm. If the conductors are of copper, the inductance of the circuit is :

(1) 50 mH (2) 45.3 mH

(3) 23.8 mH (4) 19.6 mH

4. If $\overline{E}$ is the electric field intensity, $\nabla(\nabla \times \overline{E})$ is equal to :

(1) $\overline{E}$ (2) $|\overline{E}|$

(3) Null vector (4) Zero

5. Consider a long, two wire line composed of solid round conductors. The radius of both conductors is 0.25 cm and the distance between their centres as l meters. If this distance is doubled, then the inductance per unit length :

(1) Doubles

(2) Halves

(3) Increases but does not double

(4) Decreases but does not halve

6. The conduction loss v/s device current characteristics of a power MOSFET is best approximated by :

(1) Parabola

(2) Straight Line

(3) Rectangular Hyperbola

(4) Exponentially decaying function

7. The typical ratio of latching current to holding current in a 20 thyristor is :

(1) 5 (2) 2 (3) 1 (4) 0.5

8. In a uniform electric field, field lines at equipotential surfaces :

(1) Are parallel to one another

(2) Intersect at 45°

(3) Intersect at 30°

(4) Are orthogonal

9. A hollow metallic sphere of radius r is kept at potential of 1 V. The total electric flux coming out of the concentric spherical surface of radius R ($> r$) is :

(1) $4\pi\epsilon_0 r$ (2) $4\pi\epsilon_0 r^2$

(3) $4\pi\epsilon_0 R$ (4) $4\pi\epsilon_0 R^2$

10. The sequence components of the fault current are as follows :

$I_{+ve} = j1.5\ pu, I_{-ve} = -j0.5\ pu, I_0 = -j1\ pu.$

The type of the fault in the system is :

(1) LG (2) LL (3) LLG (4) LLLG

11. If the base kVA is 25,000 then a 5000 kVA alternator with 8% reactance will have :

(1) A 4% reactance (2) A 40% reactance

(3) A 16% reactance (4) A 20% reactance

12. Ferranti effect states that under certain conditions the sending end voltage is :

(1) Less than receiving end voltage

(2) Greater than receiving end voltage

(3) Equal to receiving end voltage

(4) Abnormally high

13. If the shunt admittance of the transmission line is neglected, the maximum power will occur when torque angle :

(1) 45° (2) –90° (3) 90° (4) 180°

14. Four identical alternators each are rated for 20 MVA, 11 KV having a sub-transient of 16% are working in parallel. The short-circuit level at the bus bar is :

(1) 500 MVA (2) 400 MVA

(3) 125 MVA (4) 100 MVA

15. If the fault current is 2000A, the relay setting is 50% and CT ration is 400:5, then plug setting multiplier (PSM) will be :

(1) 15 (2) 20 (3) 12.5 (4) 10

16. Maximum power transfer capability of transmission line can be increased by :

(1) Parallel transmission lines

(2) Using series capacitance

(3) Using bundled conductors

(4) All of the above

17. A transmission line has a reactance of 1 *pu* is operating at $V_s = V_r = 1$ *pu*. The generator is connected at source end which delivering 0.5pu of active power ? Find the load angle :

(1) 35° (2) 30° (3) 32° (4) 45°

18. A network containing 100 buses in which 10 are the voltage control buses, 20 are the reactive power support bussed, 6 are the generator bi=uses and rest all are load buses. Find the size of the Jacobian matrix ?

(1) 162X162 (2) 163X163

(3) 160X160 (4) 164X164

19. Transmission lines are transposed to reduce :

(1) Skin effect

(2) Proximity effect

(3) Ferranti effect

(4) Interference with neighbouring communication

20. The generating station suitable to operate as peak load plant is :

(1) Nuclear power plant

(2) Thermal power plant

(3) Pumped storage power plant

(4) None of the above

21. An Op-Amp has an open-loop gain of 10^5 and an open-loop upper cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed loop gain of 100, then the new upper cut-off frequency is :

(1) 10 Hz (2) 100 Hz (3) 10 kHz (4) 100 kHz

22. Let $x(t)$ be a periodic signal with time period T, Let $y(t) = x(t - t_0) + x(t + t_0)$ for some t_0. The Fourier series coefficients of $y(t)$ are denoted by bk. If $b_k = 0$ for all odd k. Then t_0 can be equal to :

(1) $T/8$ (2) $T/4$ (3) $T/2$ (4) $2T$

23. A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency in kHz which is ***not*** valid is :

(1) 5 (2) 12 (3) 15 (4) 20

24. The resistance and reactance of a 100 kVA 11000/400 V, $\Delta - Y$ distribution transformer is 0.02 and 0.07 *pu* respectively. The phase impedance (in Ω) of the transformer referred to the primary is :

(1) 0.02 + j0.07 (2) 0.55 + j1.925

(3) 15.125 + j52.94 (4) 72.6 + j254.1

25. An op-amp having a slew rate of 62.8 V/μ sec is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoidal is 10 V, then the minimum frequency at which the slew rate limited distortion would set in the output is :

(1) 1 MHz (2) 6.28 MHz

(3) 10 MHz (4) 62.8 MHz

26. The *pu* parameters for a 500 MVA machine on its own base are :

Inertia, M = 20 *pu*; reactance, X = 2 *pu*. The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) 4, 0.4 (2) 100, 10

(3) 4, 10 (4) 100, 0.4

27. The increasing order of speed of data access for the following devices is :

(i) Cache Memory

(ii) CD-ROM

(iii) Dynamic RAM

(iv) Processor Registers

(v) Magnetic Tape

(1) (v), (ii), (iii), (iv), (i)

(2) (v), (ii), (iii), (i), (iv)

(3) (v), (iii), (ii), (iv), (i)

(4) (iv), (ii), (iii), (v), (i)

28. A source $v_s(t) = V\cos(100\pi t)$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load connected to the source has to extract the maximum power out of this source, its value in Ω should be :

(1) 3 (2) 4 (3) 5 (4) 7

29. The Laplace transform of a function $f(t)$ is $F(s) = \frac{5s^2 + 23s + 6}{s(s^2 + 2s + 2)}$. As $t \to \infty$, $f(t)$ approaches :

(1) 3 (2) 5 (3) 17/2 (4) ∞

30. Two wattmeters', which are connected to measure the total power on a three-phase system supplying a balanced load, read 10.5 kW and -2.5 kW, respectively. The total power and the power factor respectively, are :

(1) 13 kW, 0.334 (2) 13 kW, 0.684

(3) 13 kW, 0.52 (4) 8 kW, 0.52

31. A3-phase 440V, 50 Hz induction motor has 4% slip. The frequency of the rotor current will be :

(1) 5 Hz (2) 50 Hz (3) 25 Hz (4) 2 Hz

32. If the fault current is 2000 A the relay setting 50% and the CT ratio is 400/5, then the plug setting multiplier will be :

(1) 10 A (2) 25 A (3) 15 A (4) 50 A

33. A string insulator has 5 units. The voltage across the bottom most unit is 25% of the total voltage. The string efficiency is :

(1) 25% (2) 50% (3) 80% (4) 75%

34. Which is the following ***true*** for the bode plot ?

(1) Time response of the system for the step input

(2) It's a frequency

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

35. A 183-bus power system has 150 PQ buses and 32 PV buses. In the general case, to obtain the load flow solution using Newton Raphson method in polar coordinates, the minimum number of simultaneous equations to be solved is :

(1) 214 (2) 332 (3) 183 (4) 182

36. If the penalty factor of a plant is unity, its incremental transmission loss is :

(1) 1 (2) –1

(3) 0 (4) None of the above

37. The dielectric losses of an electrical system are 50 Watts. What will be the dielectric losses if the voltage of the system is doubled ?

(1) 50 Watts (2) 100 Watts

(3) 300 Watts (4) 200 Watts

38. The difference between sending end voltage and receiving end voltage of transmission line controls :

(1) Active power (2) Reactive power

(3) Frequency (4) None of these

39. To protect the power transformer (Y- Y, with neutral earthed) against fault, the current transformer will have :

(1) Delta-delta connection (2) Delta-star connection

(3) Star-delta connection (4) Star-star connection

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

(1) Using machines of high impedance

(2) Connecting line in series impedance

(3) Connecting lines in parallel

(4) Reducing the excitation of the machine

41. Which of the following is ***true*** ?

(1) A finite signal is always bounded

(2) A bounded signal always possesses finite energy

(3) A bounded signal is always zero outside the interval $[-t_0, t_0]$ for some t_0

(4) A bounded signal is always finite

42. A current of $-8+6\sqrt{2}\sin(\omega t+30^\circ)$ A is passed through three meters. They are a centre zero PMMC meter, a true RMS meter and a moving iron instrument. The respective readings (in A) will be :

(1) 8, 6, 10
(2) 8, 6, 8
(3) –8, 10, 10
(4) –8, 2, 2

43. A non-ideal voltage source *Vs* has an internal impedance of Z_s. If a purely resistive load is to be chosen that maximizes the power transferred to the load, its values must be :

(1) 0
(2) Real part of Z_s
(3) Magnitude of Z_s
(4) Complex conjugate of Z_s

44. A unit step voltage is applied at $t = 0$ to a series RL circuit with zero initial conditions :

(1) It is possible for the current to be oscillatory.
(2) The voltage across the resistor at $t = 0^+$ is zero.
(3) The energy stored in inductor in the steady state is zero.
(4) The resistor current eventually falls to zero.

45. The core flux of a practical transformer with a resistive load :

(1) Is strictly constant with load variation
(2) Increases with linear load
(3) Increases as the square root of the load
(4) Decreases with increased load

46. The bridge method commonly used for finding mutual inductance is :

(1) Heaviside Campbell Bridge
(2) Schering Bridge
(3) De Sauty Bridge
(4) Wien Bridge

47. A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The total size of the memory system is :

(1) 16 kB (2) 32 kB (3) 48 kB (4) 64 kB

48. A differentiable non constant even function $x(t)$ has a derivative $y(t)$, and their respective Fourier Transforms are $X(\omega)$ and $Y(\omega)$. Which of the following statements is ***true*** ?

(1) $X(\omega)$ and $Y(\omega)$ are both real

(2) $X(\omega)$ is real and $Y(\omega)$ is imaginary

(3) $X(\omega)$ and $Y(\omega)$ are both imaginary

(4) $X(\omega)$ is imaginary and $Y(\omega)$ is real

49. A 3-phase, 50 Hz, 6 pole induction motor has a rotor resistance of 0.1 Ω and reactance of 0.92.Ω. Neglect the voltage drop in stator and assume that the rotor resistance is constant. Given that the full load slip is 3%, the ratio of maximum torque to full load torque is :

(1) 1.567 (2) 1.712 (3) 1.948 (4) 2.134

50. In a microprocessor, the address of the next instruction to be executed, is stored in :

(1) Stack pointer (2) Address latch

(3) Program counter (4) General purpose register

51. Feedback control systems are :

(1) Insensitive to both forward and feedback path parameter changes

(2) Less sensitive to feedback path parameter changes than to forward path parameter changes

(3) Less sensitive to forward path parameter changes than to feedback path parameter changes

(4) Equally sensitive to forward and feedback path parameter changes

52. The unit impulse response of a unit feedback control system is given by $c(t) = -te^{-t} + 2e^{-t} (t \geq 0)$ the open loop transfer function is equal to :

(1) $\frac{s+1}{(s+2)^2}$ (2) $\frac{2s+1}{s^2}$

(3) $\frac{2s+1}{(s+1)^2}$ (4) $\frac{(s+1)}{s^2}$

53. The depletion region (or) space charge region (or) transition region in a semiconductor p-n junction diode has :

(1) Electrons and holes (2) Positive ions and electrons

(3) Positive and negative ions (4) Negative ions and holes

54. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1 is :

(1) 4 (2) 6 (3) 8 (4) 10

55. If an A. C. voltage wave is corrupted with an arbitrary number of harmonics, then the overall voltage waveform differs from its fundamental frequency component in terms of Inertia, $M = 20$ *pu*; reactance, $X = 2$ *pu* The *pu* values of inertia and reactance on 100 MVA common base, respectively are :

(1) Only the peak values (2) Only the rms values

(3) Only the average values (4) All of the above

56. The system represented by the input-output relationship $y(t) = \int_{\infty}^{5t} x(\tau)d\tau, t > 0$ is :

(1) Linear and causal (2) Linear but not causal

(3) Causal but not linear (4) Neither linear nor causal

57. A voltage waveform $v(t) = 12\ t^2$ is applied across a 1 H inductor for $t \geq 0$, with initial current through it being zero. The current through the inductor for $t \geq 0$ is given by :

(1) $12\ t$ (2) $24\ t$ (3) $12\ t^3$ (4) $4\ t^3$

58. A 10-bit A/D converter is used to digitize an analog signal in the 0 to 5V range. The maximum peak to peak ripple voltage that can be allowed in the DC supply voltage is :

(1) Nearly 100 mV (2) Nearly 50 mV

(3) Nearly 25 mV (4) Nearly 5 mV

59. A current impulse of 5 $\delta(t)$, is forced through a capacitor C. The voltage $v_c(t)$, across the capacitor is given by :

(1) $5t$ (2) $5u(t) - C$

(3) $\frac{5t}{C}$ (4) $\frac{5u(t)}{C}$

60. The graph of an electrical network has N nodes and B branches. The number of links L, with respect to the choice of a tree is given by :

(1) B – N + 1 (2) B + N

(3) N – B + 1 (4) N – 2B – 1

61. Consider system with transfer function $G(s) = \frac{s+6}{(Ks^2 + s + 6)}$. Its damping ratio will be 0.5 when the value of K is :

(1) 2/6 (2) 3 (3) 1/6 (4) 6

62. If pole-zero cancellation occurs, the system will be :

(1) Un-controllable

(2) Un-observable

(3) Either controllable or observable

(4) Either un-controllable or un-observable

63. Consider the function $f(x) = x_1^2 + 2x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_2x_3 - 4x_3x_1$. The function is :

(1) Positive definite

(2) Positive semi-definite

(3) Negative definite

(4) Negative semi-definite

64. A synchronous motor is operating on no load at unity power factor. If the field current is increased, the power factor will become :

(1) Leading and the current will decrease

(2) Lagging and the current will increase

(3) Lagging and the current will decrease

(4) Leading and the current will increase

65. The Double edge modulation eliminates certain harmonics when the reference is :

(1) Sine wave

(2) Square wave

(3) Triangular wave

(4) Trapezoidal wave

66. In dual converter :

(1) Both rectifiers provide positive current to the load

(2) Both rectifiers provide negative current to the load

(3) One rectifier provides positive current to the load and the other negative current

(4) One rectifier provides positive current to the source and the other negative current to the load

67. In communication PAC stands for :

(1) Permanent angle converter

(2) Phase angle converter

(3) Phase angle communication

(4) Phase and commutation

68. A control system described by $\dot{x} = \begin{vmatrix} -4 & 1 \\ 2 & -3 \end{vmatrix} x + \begin{vmatrix} 2 \\ 3 \end{vmatrix} u, y = [3 \quad -2]x$. The system is to be controlled by control law $u = -Kx(t)$. The feedback matrix K for placing the poles at $-4 \pm j4$ is :

(1) $K = [-10 \ \ 7]$ (2) $K = [-2 \ \ 7]$

(3) $K = [2 \ \ 7]$ (4) $K = [10 \ \ 7]$

69. Consider the matrix $A = \begin{vmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{vmatrix}$. The eigen vectors of A are :

(1) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \ \ \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{28} \ \ \frac{-46}{28}\right]'$

(2) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \ \ \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{35} \ \ \frac{-46}{35}\right]'$

(3) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \ \ \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{42} \ \ \frac{-46}{42}\right]'$

(4) $p_1 = [2 \quad -1 \quad 2]'$, $p_2 = \left|1 - \frac{3}{7} \ \ \frac{-5}{7}\right|'$ and $p_3 = \left[1 \frac{-22}{49} \ \ \frac{-46}{49}\right]'$

70. For what value of d, does the following system of linear equations has a non-trivial solution ?

$$(4d-1)x + y + z = 0$$
$$-y + z = 0$$
$$(4d-1)z = 0$$

(1) $\left(\frac{1}{2}\right)$ (2) $\left(\frac{3}{4}\right)$

(3) $\left(\frac{1}{4}\right)$ (4) 1

71. What is the correct representation of the probability distribution of a fair die that may provide an output of any number from 1 to 6 ?

(1) $p(x)=\frac{x}{6};\ x=0,1,....,6$

(2) $p(x)=\frac{1}{6};\ x=0,1,....,6$

(3) $p(x)=\int_a^b \frac{1}{6}dx;\ a=1,....,6$

(4) $p(x)=\frac{1}{8};x=0,1,....,8$

72. We wish to solve $x^2-2=0$ by Newton Rahson technique. If initial guess is $x_0=1.0$ subsequent estimate of x (i.e. x_1) will be :

(1) 1.414

(2) 2.0

(3) 1.5

(4) None of these

73. Determine the maxima and minima of the following function :

$$f(x)=x^3-6x^2+9x+25$$

(1) Maxima at $x = 1$ and minima at $x = -3$

(2) Maxima at $x = 3$ and minima at $x = -1$

(3) Maxima at $x = 1$ and minima at $x = 4$

(4) Maxima at $x = 1$ and minima at $x = 3$

74. Find the particular solution of the following differential equation :

$$\ddot{y}+y=\sec(x)$$

(1) $\cos(x)\ln|\cos(x)|+x\sin(x)$

(2) $\sin(x)\ln|\cos(x)|+x\cos(x)$

(3) $\cos(x)\ln|\cot(x)|+x\tan(x)$

(4) $\sin(x)\ln|\cos(x)|+x\cot(x)$

75. Laplace transform of piece wise continuous function $f(t)$ with a period p is:

(1) $F(s)=\dfrac{1}{1+e^{-ps}}\int_0^p e^{-st}f(t)dt$

(2) $F(s)=\dfrac{1}{1-e^{-ps}}\int_0^p e^{-st}f(t)dt$

(3) $F(s)=\dfrac{1}{1-e^{ps}}\int_0^p e^{-st}f(t)dt$

(4) $F(s)=\dfrac{1}{1+e^{-ps}}\int_0^p e^{-st}f(t)dt$

76. A fixed capacitor of reactance –j0.02 Ω is connected in parallel across a series combination of a fixed inductor of reactance j0.01 Ω and a variable resistance R. As R is varied from zero to infinity, the locus diagram of the admittance of this R-L-C circuit will be :

(1) A semi-circle of diameter j 100 and center at zero.

(2) A straight line inclined at an angle.

(3) A semi-circle of diameter j50 and center at zero.

(4) A straight line parallel to the x-axis.

77. The percentage resistance and percentage reactance of a 10 kVA, 400V/200V, 3-Phase transformer is 2% and 10 % respectively. If the constant losses in the machine are 1%. the maximum possible percentage efficiency of the transformer is :

(1) 98.32 (2) 97.25 (3) 96.85 (4) 96.12

78. A series R-L-C circuit when excited by a 10V sinusoidal voltage source of a variable frequency, exhibits resonance at 100 Hz and has a 3 dB bandwidth of 5 Hz. The voltage across the inductor L at resonance is :

(1) 10 V (2) 14.14 V (3) 7.07 V (4) 200 V

79. In the protection of transformers harmonic restraint is used to guard against :

(1) Magnetizing inrush current
(2) Unbalance operation
(3) Lightning
(4) Switching overvoltage

80. The RMS value of the current in a wire which carries a d.c. current of 10 A and a sinusoidal alternating current of peak value 20 A is :

(1) 10 A
(2) 14.14 A
(3) 15 A
(4) 17.32 A

81. In PWM bipolar voltage switching scheme for single phase inverter. DC side have following components :

(1) DC and sinusoidal components at twice the fundamental frequency
(2) DC and sinusoidal components at twice the fundamental frequency
(3) Pure DC only
(4) None of the above

82. Kirchhoff's current law can be applied on :

(1) Planer network
(2) Non-planer network
(3) All types of network
(4) Neither planer nor non-planer

83. Eigen value of Hermitian matrix is :

(1) Zero only
(2) Imaginary
(3) Real
(4) Purely Imaginary or Zero

84. Divergence theorem of gauss discuss about transformation between :

(1) Line integrals and Surface integrals
(2) Volume integrals and Line integrals
(3) Line integrals and Line integrals
(4) Surface integrals and Volume integrals

85. For a single line to ground fault the zero-sequence current is given by j 3.0 *pu*. The current carried by the neutral during the fault is :

(1) j 1.0 *pu*

(2) j 3.0 *pu*

(3) j 9.0 *pu*

(4) j 6.0 *pu*

86. The emitter of the transistor is generally doped the heaviest because it :

(1) has to dissipate maximum power

(2) has to supply the charge carriers

(3) is the first region of transistor

(4) must possess low resistance

87. A JFET has disadvantage of :

(1) being noisy

(2) having small gain bandwidth product

(3) possessing positive temperature coefficient

(4) having low input impedance

88. Routh's stability criterion can be used for determining :

(1) System response for the disturbance

(2) Absolute and relative stability of the system

(3) Noise present in the system

(4) Transient and steady state response

89. Kelvin double bridge is best suited for the measurement of :

(1) Resistance of very low value

(2) Low value capacitance

(3) Resistance of very high value

(4) High value capacitance

90. In transformer, eddy current loss is 1000 watts which is half of the total core loss. If thickness of lamination and frequency by 10%, the new core losses are :

(1) 3200 W

(2) 1000 W

(3) 2200 W

(4) 2000 W

91. A Schottky diode is a :

(1) Majority carrier device

(2) Minority carrier device

(3) Fast a recovery diode

(4) Both a majority and minority carrier diode

92. Which logic family provide maximum power dissipation ?

(1) TTL (2) CMOS (3) ECL (4) JEET

93. DC machines have ..... windings and synchronous use ..... windings.

(1) Closed, open

(2) Open, closed

(3) Open, open

(4) Closed, closed

94. The per unit impedance of a circuit element is 0.15, if the base KV and base MVA are halved, then new value of the per unit impedance of the circuit element will be :

(1) 0.30 (2) 0.0075 (3) 0.600 (4) 0.15

95. Which of these sets of logic gates are designated as universal gates ?

(1) OR, AND

(2) XOR, NOR, NAND

(3) NOR, NAND, XNOR

(4) NOR, NAND

96. In the toggle mode a JK flip flop has :

(1) J = 1, K = 1 (2) J = 0, K = 1

(3) J = 1, K = 0 (4) J = 0, K = 0

97. A 100 μA ammeter has an internal resistance of 100 ohm. For extending its range to measure 500 μA, the shunt resistance required is of :

(1) 20.0 Ω (2) 22.22 Ω

(3) 25.0 Ω (4) 50.0 Ω

98. The high torque to weight ratio in an analogue indicating instruments indicates :

(1) High friction loss (2) Low friction loss

(3) Nothing as regards friction loss (4) None of the above

99. A 3-phase 400V, synchronous motor is providing load at 0.8 p.f. lagging. If the field current of the motor is continuously increased, then :

(1) Power factor increases and the decreases

(2) Power factor is not affected

(3) Power factor decreases up to certain value of field current and then increases

(4) Power factor increases simply

100. A transmission line has a surge impedance of 400 Ω is connected with the cable having surge impedance of 40 Ω, a surge magnitude of 100 kV is travelling from the transmission line toward the cable. Find the incident current ?

(1) 100 A (2) 200 A (3) 250 A (4) 2500 A

ANSWER KEYS of Ph.D. (ELECTRICAL ENGG.) entrance exam dated 22.03.2024 for session 2023-24				
Q. NO.	A	B	C	D
1	1	3	4	3
2	1	4	1	2
3	3	2	3	3
4	4	4	2	4
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7	2	2	4	2
8	2	1	2	4
9	1	4	1	1
10	1	3	3	3
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46	1	1	4	1
47	2	2	3	1
48	1	4	2	2
49	4	1	1	3
50	3	4	3	3

ANSWER KEYS of Ph.D. (ELECTRICAL ENGG.) entrance exam dated 22.03.2024 for session 2023-24				
Q. NO.	A	B	C	D
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95	3	4	1	4
96	1	4	1	4
97	2	2	1	3
98	4	2	2	2
99	1	4	3	1
100	3	3	3	3