M.E. Electrical Engg. (Instrumentation & Control)

1. The magnitude of impedance (in ohm) of R-L-C series circuit under resonance is

   A) R B) 2 R C) $\sqrt{2}R$ D) LC

2. Pure capacitive circuit takes power from the ac line when

   A) Voltage and current are of same sign B) Voltage –ive and current +ive

   C) Voltage +ive and current -ive D) Power never flows in any part of a cycle

3. A coil with a certain number of turns has a specified time constant. If the number of turns is halved, its time constant would

   A) Remain same B) Becomes four-fold

   C) Becomes doubled D) Get halved

4. A load is connected to a source of 50V having 5Ω internal resistance. The maximum possible power supplied to the load is

   A) Zero B) 125W C) 250W D) 500W

5. In a two-wattmeter method of power measurement, one of the wattmeters shows zero reading, the power factor of load is

   A) Unity B) 0.5 C) Less than 0.5 D) Zero

6. If $v_1 = 10\sin(\omega t + 120^{\circ})$ and $v_2 = 20cos(\omega t + 120^{\circ})$ which of these statements is true?

   A) v_1 lags v_2 by 90°

   B) v_1 leads v_2 by 90°

   C) v_1 and v_2 are in phase

   D) Phase difference between $v_1$and v_2 can't be found without defining reference

7. A quantity that contains all the information in a given load is the

A) Apparent power B) Reactive power C) Average power D) Complex power

8. The ratio of power consumed in delta and star connected load having same impendence per phase for a three-phase given supply is

A) 3 B) 1/3 C) 1.732 D) 1

9. The value of function F(s) = 5s/ (s^2 + 5) at t = ∞ using final value theorem is

A) Zero B) One

C) Infinity D) Cannot be determined using final value theorem

10. If a unit step function (u(t)) is convolved with it, the result is:

A) $u^2(t)$ B) $t^2u(t)$ C) tu(t) D) δ(t)

11. When a periodic voltage $2 + 2cos\omega t$ is applied to a 2Ω resistor, the power dissipated in the resistor is

A) 2W B) 3W C) 5W D) 6W

12. When the port 1 of a two-port network is short-circuited, $I_1 = 8I_2$ and $V_2 = I_2$. Which of the following is true?

A) $y_{11} = 2$ B) $y_{12} = 8$ C) $y_{21} = 8$ D) $y_{22} = 2$

13. Which quantity in a magnetic circuit is analogous to electromotive force in an electric circuit?

A) Current B) Ampere-turns

C) Magnetic flux D) Magnetic flux density

14. The impulse response of a LTI system is a unit ramp function, the transfer function of the system is

A) $1/s^2$ B) 1/s C) 1 D) $2/ s^3$

15. Superposition theorem is applicable to

A) Linear network only B) Nonlinear network only

C) Both linear and nonlinear networks D) None of these

16. A transformer operates most efficiently at 2/3th of full-load. Its iron loss (Pi) and full load copper loss (Pc) are related as

A) Pi / Pc = 9/4 B) Pi / Pc = 3/2

C) Pi / Pc = 2/3 D) Pi / Pc = 4/9

17. In an induction motor the rotor field runs with respect to the stator

A) At synchronous speed in the same direction as the stator field

B) At the slip speed in the same direction as the stator field

C) At synchronous speed in the opposite direction as the stator field

D) At the slip speed in the opposite direction as the stator field

18. A dc series motor should not be run at light/no-load, because

A) It will draw a dangerously large current

B) It will run at a dangerously high speed

C) It will stall

D) It will run at very low speed

19. The power input to an induction motor is 50 kW when it is running at 4% slip. The stator losses are assumed negligible. Rotor copper loss is

A) 2kW B) 52kW C) 48kW D) 1kW

20. A synchronous motor is operating on no-load at unity power factor. If the field current is reduced

A) Both power factor and current will decrease

B) Power factor will decrease whereas current will increase

C) Both power factor and current will increase

D) Power factor will increase whereas current will decrease

21. When a thyristor is forward biased, the number of blocked PN junctions is

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

22. The di/dt rating of an SCR is specified for its

A) Decaying anode current B) Rising gate current

C) Decaying gate current D) Rising anode current.

23. In a single phase half wave circuit with RL load, and a freewheeling diode across the load, extinction angle β is more than π. For a firing angle α, the freewheeling diode and SCR would conduct, respectively, for

A) $\pi - \alpha, \beta$ B) $\pi - \alpha, \beta - \pi$ C) $\beta - \pi, \pi - \alpha$ D) $\beta - \alpha, \alpha$

24. Commutation overlap in the phase controlled ac to dc converter is due to

A) Load inductance B) Switching operation in the converter

C) Harmonic content of load current D) Source inductance

25. In a 3-phase full converter, the six SCRs are fired at an interval of

A) 30^0 B) 90^0 C) 60^0 D) 120^0

26. A single-phase full bridge inverter can operate in load-commutation mode in case load consists of

A) RL B) RLC over damped

C) RLC under damped D) RLC critically damped

27. A single-phase full-bridge VSI operating in square-wave mode supplies a purely inductive load. If the inverter time period is T, then the time duration for which each of the feedback diodes conduct in a cycle is

A) T B) T/4 C) T/2 D) T/8

28. As compared to power MOSFET, a BJT has

A) Lower switching losses but higher conduction losses

B) Higher switching losses but lower conduction losses

C) Higher switching and conduction losses

D) Lower switching and conduction losses

29. Improper biasing of a transistor circuit leads to

A) Distortion in the output signal

B) Faulty location of load line

C) Excessive heat production at collector terminals

D) Heavy loading of emitter terminal

30. A CRO screen has five divisions on the horizontal scale. If a voltage signal 10 sin (314 t + 60^0)V is applied with a time base setting of 20 ms/ div, the number of cycles of signal displayed on the screen will be

A) Two cycles B) 1.25 cycle C) 2.5 cycles D) five cycles

31. Two resistors of resistances 30±2 ohm and 60±3 ohm are connected in parallel. What will be absolute and relative error in equivalent resistance?

A) 11/9 ohm, 11/180 B) 9/11 ohm, 180/11

C) 9/11 ohm, 11/180 D) 13/11 ohm, 11/180

32. The power in a 3-phase four wire unbalanced circuit is to be measured. Minimum number of wattmeter(s) required is/are

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

33. The resolution of a $4\frac{1}{2}$ digit voltmeter is

A) 0.0001 B) 0.0020 C) 0.0010 D) 0.0002

34. In a wire wound strain gauge, the change in the resistance on the application of strain is mainly due to

A) Change in the length of wire B) Change in both length and diameter of wire

C) Change in diameter of wire D) Change in resistivity

35. A peizo-electric transducer has an output voltage of 3V at no load condition. It has a capacitance 250pico farad. It is connected to load capacitance of 125pico farad. What will be the voltage across load at high frequencies?

A) 1 V B) 2 V

C) 9 V D) cannot determined with the data given

36. A tachometer encoder has

A) One output B) Three outputs

C) Two outputs D) All of the above

37. An inverse transducer converts

A) Electric energy to any other form of energy

B) Mechanical displacement to electrical signal

C) Electric energy to light energy

D) Electrical energy to mechanical form

38. In a resistance potentiometer high value of resistance of potentiometer leads to

A) High value of sensitivity B) Low value of non-linearity

C) Low value of sensitivity D) Low value of error

39. A 10 bit A/D converter is used to digitise an analog signal in the 0 to 5 V range. The maximum peak to peak ripple voltage that can be allowed in the dc supply voltage is

A) Nearly 100 mV B) Nearly 5.0 mV

C) Nearly 25 mV D) Nearly 75 mV

40. CPU of an 8085 microprocessor consists of

A) ALU, accumulator, general and special purpose registers

B) Accumulator, timing and control unit

C) ALU, accumulator, timing and control circuits

D) ALU, accumulator, general and special purpose registers, timing and control circuits

41. The equivalent Boolean expression of A. (A+B) is

A) B B) AB C) A D) A+B

42. Transmission efficiency increases as

A) Both voltage and power factor increase

B) Voltage increases and power factor decreases

C) Voltage decreases power factor increases

D) Both voltage and power factor decrease

43. Consumers having low power factor equipment are advised to install

A) Tap changing transformer B) Inductors

C) Capacitor bank D) None of these

44. Relay used for protection of short transmission lines is

A) Reactance relay B) Impedance relay

C) Mho relay D) None of these

45. Bundled conductors are mainly used in high voltage overhead transmission line to

A) Reduce transmission line losses B) Reduce corona

C) Increase mechanical strength of the line D) Reduce sag

46. The rated voltage of a 3-phase power system is given as

A) rms phase voltage B) rms line to line voltage

C) peak line to line voltage D) peak phase voltage

47. Keeping in view the cost and overall effectiveness, the following circuit breaker is best suited for capacitor bank switching

A) Vacuum B) SF_6 C) Air blast D) Oil

48. If all the sequence voltages at the fault point in a power system are equal, then the fault is

A) Three-phase fault B) Line to line fault

C) Line to ground fault D) Double line to ground fault

49. For a given base voltage and base volt amperes, the per unit impedance value of an element is x. The per unit impedance value of this element when the voltage and volt amperes bases are both doubled will be

A) 0.5x B) 2x C) x D) 4x

50. In z-plane, the unit circle corresponds to

A) Imaginary axis of s-plane B) Negative real axis of s-plane

C) Positive real axis of s-plane D) Origin of the s-plane

51. In exponential series form, the state transition matrix is

A) e^{At} B) e^{-At} C) e^{-A} D) e^{A}

52. The characteristic polynomial $F(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$ is

A) Stable B) Marginally stable

C) Unstable D) None of these

53. Zero of which compensator is located nearest to origin

A) Lead compensator only B) Both lead and lag compensator

C) Lag compensator only D) None of these

54. The steady-state error of a feedback control system with an acceleration input becomes finite in a

A) Type zero system B) Type two system

C) Type one system D) Type three system

55. Moving iron instruments can be used for the measurement of

A) Current only B) Voltage only

C) Both voltage and current D) Energy

56. For a feedback control system with a characteristics equation 1+K/s(s+1)(s+2)=0. The branches originating at s = 0 and s = -1, will break away on real axis as K increases on a point

A) -1.577 B) -0.423 C) -0.605 D) -0.005

57. Peak overshoot explicitly indicative of

A) Settling time B) Rise time

C) Natural frequency D) Damping ratio

58. The damping ratio of a system having characteristic equation s^2+2s+8=0

A) 0.353 B) 0.330 C) 0.500 D) 0.800

59. A 3-phase four wire star connected load takes line current of 2.5$\angle 60^0$A, 2.5$\angle$ -60^0A and 2.5A. The neutral current is

A) 5 A B) 0 A C) 10 A D) 15 A

60. The Laplace transform of $t\ cos\ (3\omega t)$ is

A) $(s^2+9)/(s^2-9)$ B)$(s^2-9)/(s^2+9)$
C) $(s^2-9)/(s^2+9)^2$ D) $(s^2+9)/(s^2-9)^2$

61. A system with transfer function $G(s)=\frac{(s^2+9)(s+2)}{(s+1)(s+3)(s+4)}$ is excited by $\sin(\omega t)$. The steady-state output of the system is zero at

A) ω = 1 rad/s B) ω = 2 rad/s C) ω = 3 rad/s D) ω = 4 rad/s

62. Starter in electric motor is used to

A) Limit high starting current B) Produce high starting torque

C) Increase the efficiency D) Control speed

63. The power factor of an induction motor at light load is

A) High B) Low C) Unity D) Zero

64. A three-phase slip ring induction motor develops a maximum torque of 120N-m for a rotor resistance of 4Ω, what will be the value of maximum toque if rotor resistance is halved.

A) 200 N-m B) 50 N-m C) 120 N-m D) 400 N-m

65. An ideal capacitor is charged to V_0 volts and connected at t = 0 across an ideal inductor L.

If $\omega_0 = \frac{1}{\sqrt{LC}}$, the voltage across the capacitor at time t > 0 is given by

A) V_0 B) $V_0 \cos(\omega_0 t)$

C) $V_0 \sin(\omega_0 t)$ D) $V_0 e^{-\omega_0 t} \cos(\omega_0 t)$

66. The signal flow graph is used for the determination of

A) Transfer function of a system B) Initial conditions of a system

C) Response of a system for a given input D) Both A) and C)

67. A 0-200 V voltmeter has an accuracy of 2 percent at full-scale reading. What will be the error (in %) if it reads 100 V?

A) 1 B) 2 C) 0.5 D) 4

68. The overexcited synchronous motor operates at

A) Leading power factor B) Lagging power

C) Unity power factor D) Zero power factor

69. The open loop transfer function of a unity –gain feedback control system is given by, $G(s) = \frac{10}{(s+3)(s+5)}$, the gain margin of the system in dB is given by

A) Zero B) One C) Five D) ∞

70. A system is defined by its impulse response $(n) = 2^n u(n-2)$. The system is

A) Stable and casual B) Casual but not stable

C) Stable but not casual D) Unstable and non-casual

71. The matrix A is given as A= [0 1 -1; -6 -11 6; -6 -11 5], the ratio of maximum eigen value to minimum eigen value is

A) 1.00 B) 0.50 C) 0.33 D) 3.00

72. A non ideal voltage source has a source impedance z_s with a resistive load, then at what value of load resistance the maximum power is transferred to load?

A) Load resistance is equal to source resistance

B) Load resistance is equal to complex conjugate of z_s

C) Load resistance is equal to magnitude of z_s

D) Load resistance is equal to source reactance

73. A step-up chopper supplying a load at 400V and operating at 250V. The off time of switch is 20μs and inductor current is continuous and ripple free. The frequency of chopper in kHz is

A) 31.25 B) 21.25 C) 0.031 D) 42.25

74. The bridge method commonly used for finding mutual inductance is

A) Heaviside Campbell bridge B) Schering bridge

C) De Sauty bridge D) Wien bridge

75. A 4-bit synchronous counter uses flip-flops with propagation delay times of 15 ns each. The maximum possible time required for change of state will be

A) 15 ns B) 30 ns C) 45 ns D) 60 ns

x-x-x