Q. No. 1 – 25 Carry One Mark Each

1. The steady state current response of a series R-L-C circuit to sinusoidal input of $10\sin \omega t$ V is given by $5\sin(\omega t - 30^\circ)$ A. Its current response to an input of $10\cos \omega t + 30^\circ$ V will be

   (A) $5\cos \omega t + 30^\circ$ A

   (B) $5\sin \omega t$ A

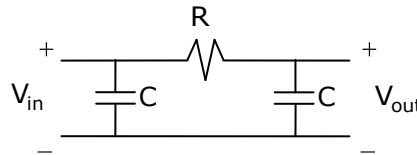   (C) $5\sin \omega t + 30^\circ$ A

   (D) $5\cos \omega t$ A

2. The Laplace transform of x(t) is x(s) where $x(s) = \dfrac{3s + 4}{s(s+1)(s+2)^2}$

   The initial value of x(s) is

   (A) 1   (B) 0   (C) ∞ (D) 4

3. The circuit shown in the following figure is a

   (A) LPF

   (B) HPF

   (C) BPF

   (D) APF

4. A constant power load is driven by a dc shunt motor. The motor is operated at its rated condition. Now, suddenly the terminal voltage is reduced to half. Then the effect on the torque and armature current is (neglect losses and saturation)

   (A) T_e & I_a remains same

   (B) T_e is doubled and I_a is same

   (C) T_e is halved and I_a is same

   (D) T_e is same and I_a is doubled

5. Choose the typical curve of the ratio of effective ac resistance to dc resistance as a function of frequency for a copper bar (deep bars) of a squirrel-cage rotor.
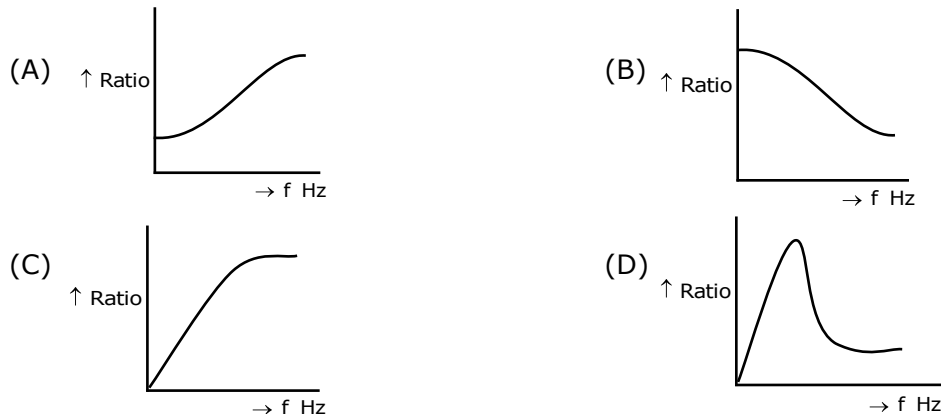
6. An increase in the value of the hold capacitor in a sample-and-hold circuit results
   (A) Decrease in the acquisition time and decrease in the drop rate
   (B) Decrease in the acquisition time and increase in the drop rate
   (C) Increase in the acquisition time and increase in the drop rate
   (D) Increase in the acquisition time and decrease in the drop rate

7. The rank of matrix $\begin{bmatrix} K & -1 & 0 \\ 0 & K & -1 \\ -1 & 0 & K \end{bmatrix}$ is 2. Then the value of K is _____.

   (A) 0   (B) 1   (C) 2   (D) 3

8. $\displaystyle\int_{2}^{4} \frac{\sqrt{x}}{\sqrt{x} + \sqrt{6-x}} \, dx =$ _____.

   (A) 0   (B) 1   (C) 2   (D) 3

9. Given the velocity $v = \dfrac{ds}{dt} = 32t - 2$ and the initial position of the body as $s\left(\dfrac{1}{2}\right) = 4$, the body's position at time 't'?

   (A) $s = 16t^2 - t + 1$ (B) $s = 16t^2 - 2t - 1$ (C) $s = 16t^2 - 2t + 1$ (D) $s = 16t^2 + t - 1$

10. A signal $x(t) = 2\cos 40\pi t + \sin 60\pi t$ is sampled at 75 Hz. The number of full periods of x (t) it takes to obtain one period of x[n] is _____.

11. The $i(o^+)$ in the following network is _____ (A).
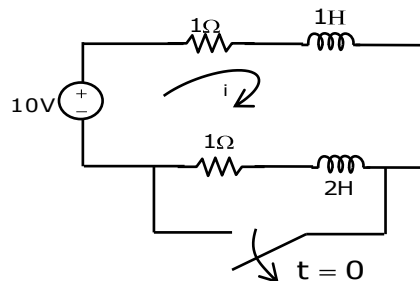
12. A series reactor is used in between the two interconnected systems because

    (A) To improve power factor
    (B) To improve the voltage regulation
    (C) To improve the reliability
    (D) To reduce the losses in the Transmission lines.

13. In a cylindrical pole alternator with negligible resistance maximum reactive power output is

(A) $-V_t^2\left(\dfrac{1}{x_q}+\dfrac{1}{x_d}\right)$

(B) $-\dfrac{V_t^2}{x_d}$

(C) $\dfrac{E_f V_t}{X_d}-\dfrac{V_t^2}{x_d}$

(D) $-\dfrac{V_t^2}{x_q}$

14. A $2000/200\ V, 50\ Hz, 1-phase$ transformer has an exciting current of 6A with core-loss of 250 W when LV side is excited with rated voltage. The no-load power factor and magnetizing component of current are

(A) 0.208, 5.87A
(B) 0.77, 6A
(C) 0.14, 4.28A
(D) 0, 1.25A

15. A unity feedback closed loop system has $G\ s\ =\dfrac{1}{s^2}$ and a PD controller $G_c\ s$ in the forward path. If $G_c\ s\ =T_p\left[1+T_D s\right]$ where T_P and T_D are positive adjustable parameters, then which one of the following statements is false?

(A) The system is always stable.
(B) The system may have damped oscillation for a unit-step input.
(C) The system amplifies the noise.
(D) The system has zero steady state error for a unit parabolic input.

16. The Transfer function $\dfrac{Y\ s}{X\ s}$ of the LTI system shown below is

(A) $\dfrac{G_1\ s\left[G_2\ s\ +1\right]}{1-G_1\ s\ G_2\ s}$

(B) $\dfrac{G_2\ s\left[1+G_1\ s\right]}{1-G_2\ s\ G_1\ s}$

(C) $\dfrac{G_1\ s\left[1+G_1\ s\right]}{1-G_1\ s\ +G_2\ s}$

(D) $\dfrac{G_2\ s\ 1+G_1\ s}{1+G_1\ s\ +G_2\ s}$
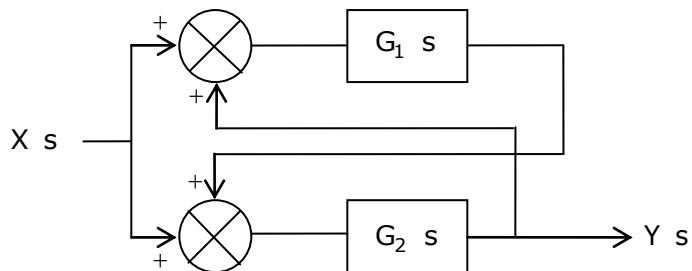
17. After an experiment the following are the values measured by a student with a stop watch. (The experiment can be repeated again & again: Assumption)

TRIAL NO	1	2	3	4	5
Measured Values (Sec)	3.9	3.5	3.7	3.4	3.5

How can we express his measured value?

(A) $3.5 \pm 0.2 \sec s$ (B) $3.4 \pm 0.1 \sec s$

(C) $3.6 \pm 0.1 \sec s$ (D) $3.6 \pm 0.2 \sec s$

18. The conductors of a three phase, 50Hz, 125 km long transmission line are as shown in figure. The diameter of each conductor is 0.6cm. What is the value of reactance per phase?
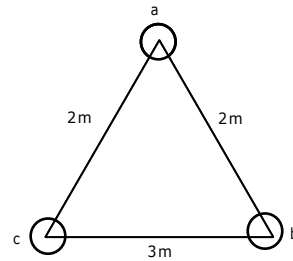
(A) 54.19Ω

(B) 64.19Ω

(C) 44.19Ω

(D) 74.19Ω

19. The residue of the function $f(z) = \dfrac{z}{(z-1)(z+1)^2}$ at z = -1 is

(A) $\dfrac{1}{2}$ (B) $-\dfrac{1}{2}$ (C) $\dfrac{1}{4}$ (D) $-\dfrac{1}{4}$

20. The maximum demand on power plant is 750 MW, the annual load factor is 65% & the capacity factor is 50%. The reserve capacity factor (in MW) of the plant is _____.

21. 60 thyristors are connected in series and parallel to form a 10KV & 5.5KA switch. Each thyristor is rated for 1.2KV and 1KA. The numbers of parallel paths are six. Then the percentage string efficiency of the switch is _____.
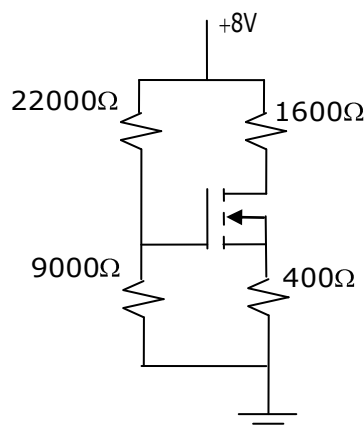
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22. The slope in Ampere/Volt of the I_D-V_{DS} load-line for the circuit shown below is

(A) $\dfrac{-1}{400}$
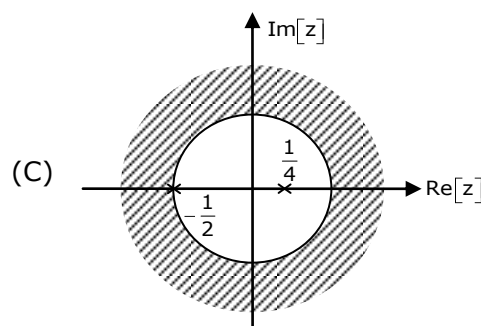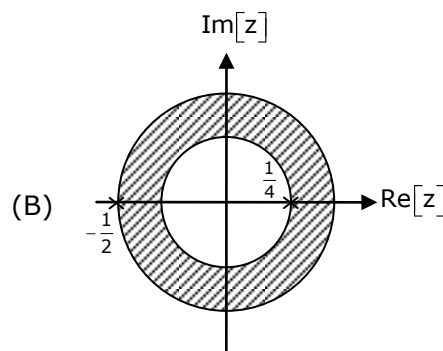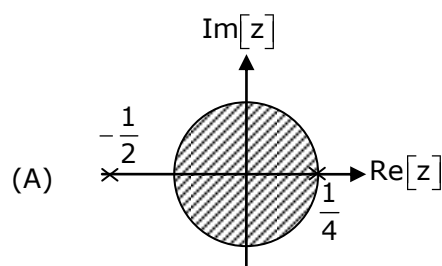
(B) $\dfrac{-1}{1600}$

(C) $\dfrac{-1}{2000}$
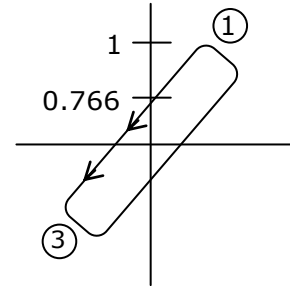
(D) $\dfrac{-1}{31000}$

23. Identify the ROC associated with the z-transform of a signal

$$x[n] = \left(-\dfrac{1}{2}\right)^n u[-n-1] + 2\left(\dfrac{1}{4}\right)^n u[n]$$


(A)

(B)

(C)

(D) Empty Set

24. When X an Y inputs are driven with sinusoidal alternating voltages, the following Lissajous pattern is displayed on the screen of oscilloscope. The phase difference in degrees between the inputs is _____.

25. The minimum expression for the Boolean function

$$f = x + y + z \quad x + y + \bar{z} \quad x + \bar{y} + z \quad x + \bar{y} + \bar{z} \quad \bar{x} + y + z \quad \bar{x} + y + \bar{z} \quad \bar{x} + \bar{y} + \bar{z} \quad \text{is}$$

(A) $xy\bar{z}$ (B) xyz (C) $x\bar{y}z$ (D) $\bar{x}\bar{y}\bar{z}$

Q. No. 26 – 51 Carry Two Marks Each

26. In the network shown below, the initial charge on capacitor and current in the inductor are zero. The minimum time after the switches are closed at t=0 at which the voltage V_x becomes zero is
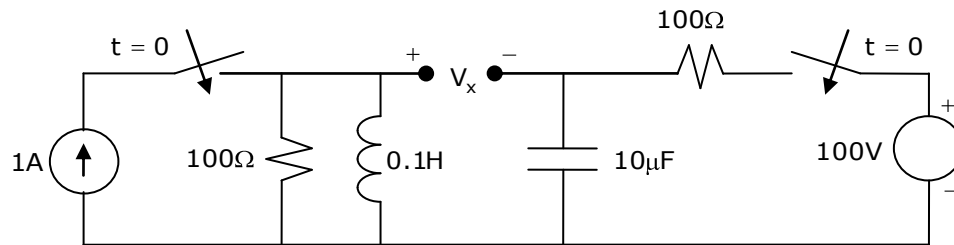
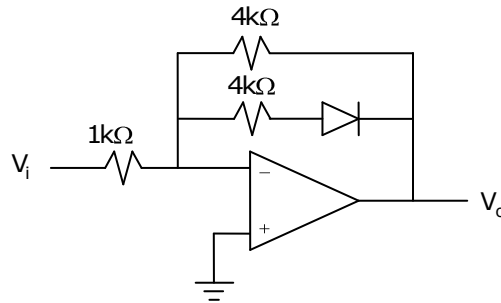(A) 0.5msec   (B) 0.63msec   (C) 0.693msec   (D) 1msec

27. In the figure given below, assume that the diode and op-amp are ideal. For V_i varying from +1V to -1V, the output voltage V_0 will vary from

(A) -2V to +2V

(B) -2V to +4V

(C) -4V to +4V

(D) -4V to +2V

28. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ then $A^6 - 4A^5 + 8A^4 - 12A^3 + 14A^2 = $ _____

(A) 0   (B) 4A   (C) 4A + 5I   (D) -4A + 5I

29. A 100KVA, 440 V 3-phase Y-connected alternator has the following losses.
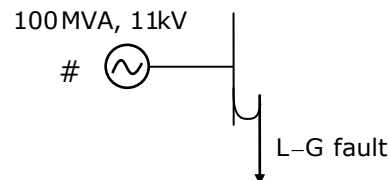
→ Friction & windageloss=300 W

→ Core-loss=480 W

→ Field winding resistance = $150\,\Omega$ (at operating temperature)

→ Armature resistance per phase = $0.02\,\Omega$

The efficiency (in %) at unity power factor with half rated load if the field is excited by 200 V is _____.

30. Consider a circuit as shown:

$x_{1eq} = x_{2eq} = 0.15PU$, $x_{0eq} = 0.05PU$

100MVA, 11kV

#

L–G fault

When SLG fault occurs at bus, then the actual fault current in KA is _____.

31. A tuned coil resonates at 1 MHz with a resonating capacitance of 420 PF. When the frequency is raised to 1.5 MHz the resonance is obtained at 140 PF. Now the self capacitance (in pF) of the coil will be _____.

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32. The voltage across and current through a device (MOSFET) is shown in fig. Temperature between junction and the base is $10°C$ and thermal resistance from junction to base is $0.1°C/W$. Switching frequency is 5KHZ. $T_{on} = T_{off} = 0.1\mu\sec$

The device can be realized as a fixed dc source V_d in series R_d, the value of v_d =1V. Then the value of R_d in ohms is _____.
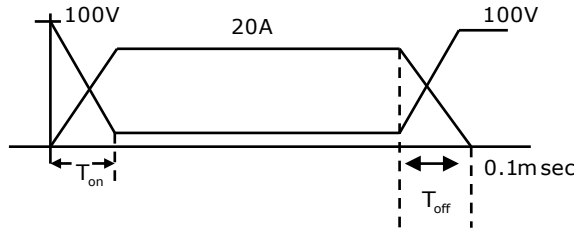
33. For a 2500/250V, 20 KVA $1-\phi$ transformer the core-loss is 50W. The ohmic loss at 1¼ loading is 100W. The maximum efficiency of the transformer at unity p.f. is _____.

34. Power in a $1-\phi$ circuit is measured using an electrodynamometer wattmeter. The resistance and inductance of wattmeter voltage circuit are 2500Ω and $20\,mH$. At a frequency of 50 Hz and at a power factor of 0.3, the load voltage and load current are 120V and 10A respectively. The current coil has negligible inductance and a minimal resistance of $0.2\,\Omega$. What will be the % error in wattmeter reading when pressure coil is connected on the load side?

(A) 0.797%   (B) 2.397%   (C) 0.790%   (D) 2.341%

35. A 4-bit serial-in-parallel-out shift register is used with a feedback as shown in figure. The shifting sequence is $Q_A \to Q_B \to Q_C \to Q_D$. If the output is 0000 initially, then the output repeats after

(A) 4 clock cycles

(B) 6 clock cycles

(C) 15 clock cycles

(D) 16 clock cycles
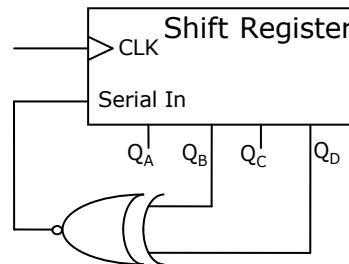
36. In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective, the probability that it is manufactured from machine C is

(A) $\dfrac{10}{31}$ (B) $\dfrac{20}{31}$ (C) $\dfrac{11}{31}$ (D) $\dfrac{15}{31}$
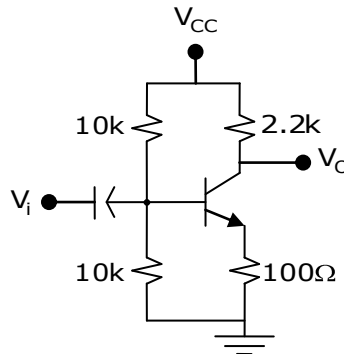
8

37. Assume simplified h-parameter model for the transistor circuit shown below. $h_{fe}=100$, $h_{ie}=900\Omega$; $R_s=0$. The small signal voltage gain $\dfrac{V_o}{V_i}$ is given by

(A) -22

(B) -20

(C) 20

(D) 22

38. An Ayrton shunt is designed to give the ammeter a current range of 1A,5A and 10A. If the internal resistance of PMMC is $50\,\Omega$ and full scale deflection current is 1mA. Find the values of the resistances in milli ohms?

(A) 5,5,39.9   (B) 6,6,49.9

(C) 9.5,8.5,50   (D) 10.5,15,65.5

39. The value of $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = yz\bar{i} + xz\bar{j} + xy\bar{k}$ and C is the curve bounded by $x+y=1,\ x=0,\ y=0$ in $xy-$plane is _____.

(A) -2   (B) 2   (C) 1   (D) 0

40. In the circuit, the thyristor has a junction capacitance of 20PF. The value of C=25nF and the minimum charging current to turn on the thyristor is 10mA. The minimum value of R_L to avoid the $\dfrac{dv}{dt}$ triggering is _____.

(A) 5Ω (B) 10Ω (C) 8Ω (D) 12.5Ω
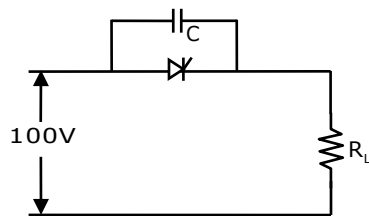
41. A cup of coffee at 190^oF is kept in a room temperature of 70^oF. At time t=0, the coffee is cooling at 15^oF per minute, how long will it take for the temperature to reach 143^oF?

(A) 2.6 min   (B) 4.5 min   (C) 3.98 min   (D) 5.7 min

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42. Match the transfer functions with the response to a unit step input shown in the figure below.
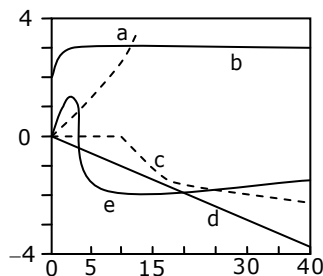
i. $\dfrac{-2.5 \ -4s + 1}{4s^2 + 4s + 1}$

ii. $\dfrac{-2e^{-10s}}{10s + 1}$

iii. $\dfrac{-5}{-20s + 1}$

iv. $\dfrac{-0.1}{s}$

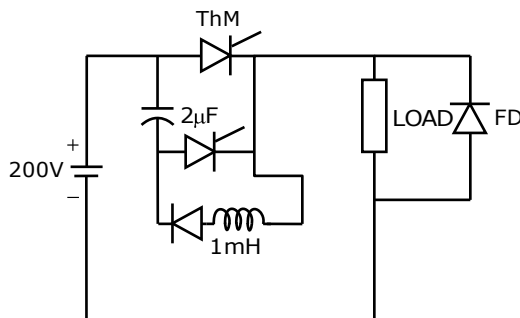v. $\dfrac{4s + 3}{2s + 1}$

(A) i-e; ii-c; iii-a; iv-d; v-b   (B) i-a; ii-b; iii-c; iv-d; v-e

(C) i-b; ii-a; iii-c; iv-e, v-d   (D) i-e; ii-a; iii-c; iv-b; v-d

43. Consider the chopper circuit of figure shown below

The chopper operates at 400 Hz and 5% duty cycle. The load current remains almost ripple free at 10A. Assuming the input voltage of 200V and the devices to be ideal, the turn off time (in μsec) available to the thyristor ThM is _____.

44. A certain alternator having a field excitation of 15A gives a current of 200A on short circuit and an electromotive force of 1200V on open circuit with the same field excitation. The internal voltage drop (V) with a load current of 50A will be _____.

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45.   Consider the following 8085 microprocessor program

         MVI B, 00H

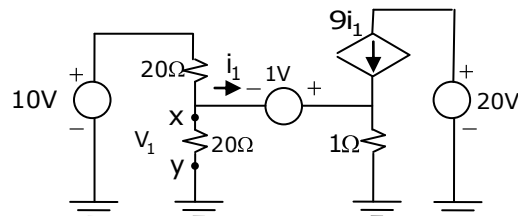   MVI C,08H

         MOV A,D

    BACK: RAR

         JNC SKIP

         INR B

    SKIP: DCR C

         JNZ BACK

         HLT

    The program

    (A) Arranges numbers in the ascending order

    (B) Finds the negative numbers in a block of data

    (C) Counts number of one's in a number

    (D) Counts number of zeroes in a number

46.   The impulse response $h[n] = e^{2n}u[n-1]$ is

    (A) Memory-less, causal, stable   (B) Not memory-less, non-causal, stable

    (C) Memory-less, non-causal, stable   (D) Not memory-less, causal, not stable

47.   A buck converter operating at 50 KHZ is fed from a 12V battery and supplies 5V to load. Neglect switch and device losses. Given that battery voltage varies from 13.5 V in fully charge state to 10V. The maximum on-period (in μsec) of switch at the end of discharge is _____.

    (A) 10   (B) 20   (C) 30   (D) 50
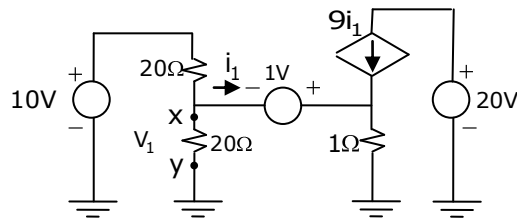
Common Data Questions: 48 & 49

Consider the network diagram.

48.   The value of V_1 is _____ (V).

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Consider the network diagram.

49.　The Thevenin's equivalent voltage across x and y is _____ (V).

Common Data Questions: 50 & 51

A cable with surge impedances of 200 ohms is terminated in two parallel-connected, open-wire lines having surge impedance of 500 and 1000 ohms respectively. A steep-fronted travelling wave of 2000V travels along the cable and reached the transition point.

50.　The reflected voltage in V is _____.

A cable with surge impedances of 200 ohms is terminated in two parallel-connected, open-wire lines having surge impedance of 500 and 1000 ohms respectively. A steep-fronted travelling

51.　The current in the cable in A is _____.

Linked Answer Questions: Q.52 to Q.55 Carry Two Marks Each

Statement for Linked Answer Questions: 52 & 53

In a 3-phase induction motor, it has been observed that the stator reactance is equal to the equivalent rotor stand still reactance, while each resistance is equal to $\frac{1}{3}^{rd}$ of this value. At a slip of 4%, a torque of 425 N-m is developed.

52.　Find the starting torque?
(A) 1000 N-m　　(B) 750 N-m　　(C) 302 N-m　　(D) 525 N-m

In a 3-phase induction motor, it has been observed that the stator reactance is equal to the equivalent rotor stand still reactance, while each resistance is equal to $\frac{1}{3}^{rd}$ of this value. At a slip of 4%, a torque of 425 N-m is developed.

53. Determine starting torque to maximum Torque ratio?
(A) 0.735 (B) 0.645 (C) 0.555 (D) 0.354

Statement for Linked Answer Questions: 54 & 55

Consider the system shown in the figure.
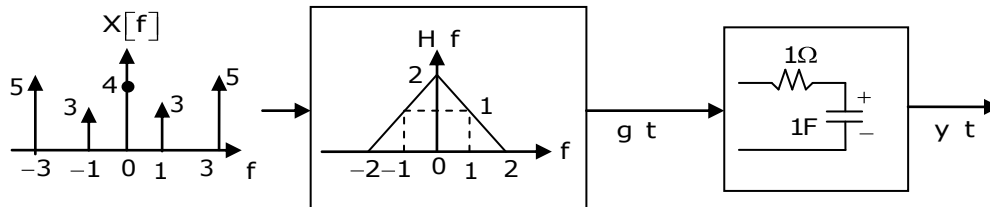
54. g t is
(A) $8 + 6\cos 2\pi t$ (B) $12 + 6\cos 2\pi t$ (C) $8 - 6\cos 2\pi t$ (D) $12 - 6\cos 2\pi t$

Consider the system shown in the figure.
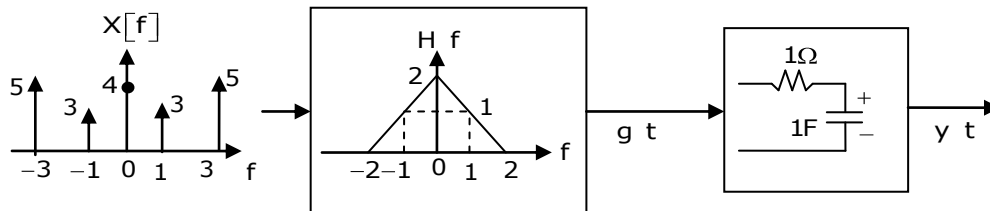
55. The D.C component in signal y(t) is
(A) 0.9341 (B) 0 (C) 12 (D) 8

Q. No. 56 – 60 Carry One Mark Each

56. The synonym for the word "PROFLIGACY" is
(A) Conservation (B) Reservation (C) Wasteful (D) Tasteful

13

57.   Find the odd one out:

(A) Zoom   (B) Rush   (C) Whizz   (D) Zither

58.   Examiner: Examinee: : Preceptor:

(A) Disciple   (B) Customer   (C) Guest   (D) Host

Find out the error part in the given sentences:

59.   He told that /he hadn't/ eaten anything/ for over a week

[A]   [B]   [C]   [D]

60.   The sum of money at S.I amounts to Rs.800 in 4 years & to Rs.900 in 5 years. The sum is

(A) 400   (B) 600   (C) 300   (D) 1200

Q. No. 61 – 65 Carry Two Marks Each

61.   A girl Sneha always complained about breakfast. The cook tried everything but she was unhappy. She went to a super market and brought one of those ready-to-cook packets. She cooked the packets on her own and found the food to be delicious.

Choose the best supporting statement:

(A) Practice makes man perfect.

(B) The mind is not a vessel to be filled, but a fire to be ignited.

(C) Smart work is the key to success.

(D)Nothing gives as much satisfaction as earning our rewards

62.   Price of commodities X & Y increases 40paise & 15paise every year respectively. If in 2001, the price of commodity X was Rs, 4.20 and that of Y was Rs. 6.30, in which year commodity X will cost 40paise more than Y ?

(A) 2010   (B) 2011   (C) 2012   (D) 2013

63.   A alone can do a piece of work in 6 days & B in 8 days. A & B undertook to do it for Rs.3200 with the help of C, they completed work in 3 days. How much is to be paid to C?

(A) 200   (B) 300   (C) 400   (D) 600

64.   Three times the first of three consecutive odd integers is 3 more than twice the third integer. Find the third integer.

(A) 17   (B) 11   (C) 9   (D) 1

Information for Q.N. 65

Proportion of components in Human body

Percentage of components in Human body

65. What % of total weight of human body is equivalent to weight of proteins in skin in human body?
(A) 3.6
(B) 2.6
(C) 1.6
(D) Cannot be determined