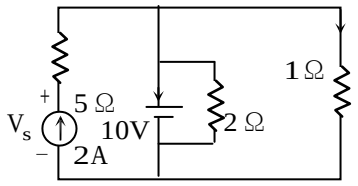
49. The optimum threshold to achieve minimum bit error rate (BER) is

(A) $\frac{1}{2}$ (B) $\frac{4}{5}$ (C) 1 (D) $\frac{3}{2}$

Answer: (B)

Common Data Questions: 50 & 51

Consider the following figure



50. The current I_S in Amps in the voltage source, and voltage V_S in Volts across the current source respectively, are

(A) 13, -20 (B) 8, -10 (C) $-8, 20$ (D) $-13, 20$

Answer: (D)

51. The current in the $1\,\Omega$ resistor in Amps is

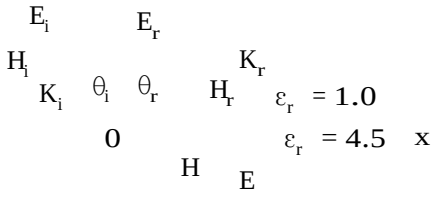
(A) 2 (B) 3.33 (C) 10 (D) 12

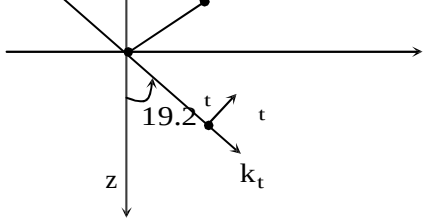
Answer: (C)

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

Statement for Linked Answer Questions: 52 & 53

A monochromatic plane wave of wavelength $\lambda = 600\,\mu m$ is propagating in the direction as shown in the figure below. E_i, E_r, and E_t denote incident, reflected, and transmitted electric field vectors associated with the wave.





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52. The angle of incidence θ_1 and the expression for E_i are

(A) 60^0 and $\frac{E_0}{\sqrt{2}}(\hat{a}_x - \hat{a}_z)e^{-j\frac{\pi\times10^4(x+z)}{3\sqrt{2}}}$ V/m

(B) 45^0 and $\frac{E_0}{\sqrt{2}}(\hat{a}_x + \hat{a}_z)e^{j\frac{\pi\times10^4 z}{3}}$ V/m

(C) 45^0 and $\frac{E_0}{\sqrt{2}}(\hat{a}_x - \hat{a}_z)e^{-j\frac{\pi\times10^4(x+z)}{3\sqrt{2}}}$ V/m

(D) 65^0 and $\frac{E_0}{\sqrt{2}}(\hat{a}_x - \hat{a}_z)e^{-j\frac{\pi\times10^4 z}{3}}$ V/m

Answer: (C)

53. The expression for E_r is

(A) $0.23\frac{E_0}{\sqrt{2}}(\hat{a}_x + \hat{a}_z)e^{-j\frac{\pi\times10^4(x-z)}{3\sqrt{2}}}$ V/m

(B) $-\frac{E_0}{\sqrt{2}}(\hat{a}_x + \hat{a}_z)e^{j\frac{\pi\times10^4 z}{3}}$ V/m

(C) $0.44\frac{E_0}{\sqrt{2}}(\hat{a}_x + \hat{a}_z)e^{-j\frac{\pi\times10^4(x-z)}{3\sqrt{2}}}$ V/m

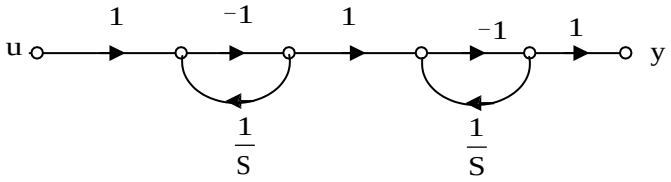
(D) $\frac{E_0}{\sqrt{2}}(\hat{a}_x + \hat{a}_z)e^{-j\frac{\pi\times10^4(x+z)}{3}}$ V/m

Answer: (C)

Statement for Linked Answer Questions: 54 & 55

The state diagram of a system is shown below. A system is described by the state-variable equations

$\dot{X} = AX + Bu;\ y = CX + Du$



54. The state-variable equations of the system shown in the figure above are

(A) $\dot{X} = \begin{bmatrix}-1 & 0\\ -1 & -1\end{bmatrix}X + \begin{bmatrix}1\\ 1\end{bmatrix}u$

(B) $\dot{X} = \begin{bmatrix}-1 & 0\\ 1 & -1\end{bmatrix}X + \begin{bmatrix}-1\\ 1\end{bmatrix}u$

$$y = \left(1 - 1\right)^{-1} X + u \qquad y = \left(1 - 1\right)^{-1} X + u$$

(C) $\dot{X} = \begin{bmatrix} -1 & 0 \\ -1 & -1 \end{bmatrix} X + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$ $\quad y = \begin{bmatrix} -1 & 1 \end{bmatrix} X$

(D) $\dot{X} = \begin{bmatrix} -1 & -1 \\ 0 & -1 \end{bmatrix} X + \begin{bmatrix} 1 \\ -1 \end{bmatrix} u$ $\quad y = \begin{bmatrix} -1 & 1 \end{bmatrix} X$

Answer: (A)

55. The state transition matrix e^{At} of the system shown in the figure above is

(A) $\begin{bmatrix} e^{-t} & 0 \\ te^{-t} & e^{-t} \end{bmatrix}$ (B) $\begin{bmatrix} e^{-t} & 0 \\ -te^{-t} & e^{-t} \end{bmatrix}$ (C) $\begin{bmatrix} e^{-t} & 0 \\ e^{-t} & e^{-t} \end{bmatrix}$ (D) $\begin{bmatrix} e^{-t} & -te^{-t} \\ 0 & e^{-t} \end{bmatrix}$

Answer: (A)

Q. No. 56 – 60 Carry One Mark Each

56. Choose the grammatically CORRECT sentence:

(A) Two and two add four (B) Two and two become four

(C) Two and two are four (D) Two and two make four

Answer: (D)

57. Statement: You can always give me a ring whenever you need.

Which one of the following is the best inference from the above statement?

(A) Because I have a nice caller tune

(B) Because I have a better telephone facility

(C) Because a friend in need in a friend indeed

(D) Because you need not pay towards the telephone bills when you give me a ring

Answer: (C)

58. In the summer of 2012, in New Delhi, the mean temperature of Monday to Wednesday was 41°C and of Tuesday to Thursday was 43°C. If the temperature on Thursday was 15% higher than that of Monday, then the temperature in °C on Thursday was

(A) 40 (B) 43 (C) 46 (D) 49

Answer: (C)

Explanations:- Let the temperature of Monday be T_M

Sum of temperatures of Tuesday and Wednesday = T and

Temperature of Thursday $= T_{Th}$

Now, $T_m + T = 41 \times 3 = 123$

& $T_{th} + T = 43 \times 3 = 129$

$\therefore T_{Th} - T_m = 6$, Also $T_{Th} = 1.15$

$\therefore 0.15T_m = 6 \Rightarrow T_m = 40$

$\therefore$ Temperature of thursday $= 40 + 6 = 46^O$

59. Complete the sentence:

Dare _____mistakes.

(A) commit (B) to commit (C) committed (D) committing

Answer: (B)

60. They were requested not to quarrel with others.

Which one of the following options is the closest in meaning to the word quarrel?

(A) make out (B) call out (C) dig out (D) fall out

Answer: (D)

Q. No. 61 – 65 Carry Two Marks Each

61. A car travels 8 km in the first quarter of an hour, 6 km in the second quarter and 16km in the third quarter. The average speed of the car in km per hour over the entire journey is

(A) 30 (B) 36 (C) 40 (D) 24

Answer: (C)

Explanations:-Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

$$= \frac{8+6+16}{\frac{1}{4}+\frac{1}{4}+\frac{1}{4}} = 40\,\text{km/hr}$$

62. Find the sum to n terms of the series $10 + 84 + 734 + \ldots$

(A) $\frac{9\left(9^n+1\right)}{10}+1$ (B) $\frac{9\left(9^n-1\right)}{8}+1$ (C) $\frac{9\left(9^n-1\right)}{8}+n$ (D) $\frac{9\left(9^n-1\right)}{8}+n^2$

Answer: (D)

Explanations:-Using the answer options, substitute n = 2. The sum should add up to 94

63. Statement: There were different streams of freedom movements in colonial India carried out by the moderates, liberals, radicals, socialists, and so on.

Which one of the following is the best inference from the above statement?

(A) The emergence of nationalism in colonial India led to our Independence

(B) Nationalism in India emerged in the context of colonialism

(C) Nationalism in India is homogeneous

(D) Nationalism in India is heterogeneous

Answer: (D)

64. The set of values of p for which the roots of the equation $3x^2 + 2x + p(p-1) = 0$ are of opposite sign is

(A) $(-\infty, 0)$ (B) $(0,1)$ (C) $(1,\infty)$ (D) $(0,\infty)$

Answer: (B)

65. What is the chance that a leap year, selected at random, will contain 53 Sundays?

(A) 2/7 (B) 3/7 (C) 1/7 (D) 5/7

Answer: (A)

Explanations:-There are 52 complete weeks in a calendar year $852 \times 7 = 364$ days

Number of days in a leap year = 366

$\therefore$ Probability of 53 Saturdays = $\frac{2}{7}$