Q.1 – 25 Carry One Mark Each.

1. In amplifier application, FET is operated in
   a) The controlled resistor region
   b) The controlled source region
   c) The avalanche breakdown region
   d) None

2. The gain of the emitter follower is approximately equal to

   a) α
   b) β
   c) $1+\beta$
   d) $\dfrac{1}{1-\alpha}$

3. Op-amp used as a tuned amplifier has circuit connected across
   a) input
   b) series impedance
   c) feedback impedance Z_f
   d) output

4. An 'n' bit ADC using V_R as reference voltage has resolution (in volts) of

   a) $\dfrac{V_R}{I^n}$
   b) $\dfrac{V_R}{n}$
   c) $\dfrac{V_R}{2^{n-1}}$
   d) $\dfrac{V_R}{2n}$

5. A helical antenna is used for satellite tracking because of its
   a) broad bandwidth
   b) maneuverability
   c) circular polarization
   d) good front-to-back ratio

6. The type of BJT preferred as a switch is
   a) pnp
   b) npn
   c) both
   d) none

7. The logic(s) which is (are) not affected by active low or active high level is/are:
   a) XOR
   b) NAND
   c) NOR
   d) None

8. $A_1 A_2 A_3$ are ideal ammeters. If A_1 reads 5A, A_2 reads 12A, then A_3 should read

$100\sin\omega A$
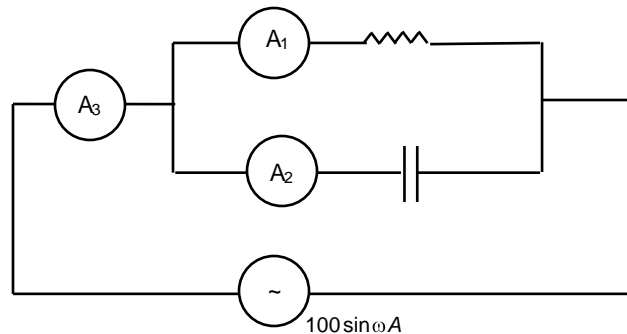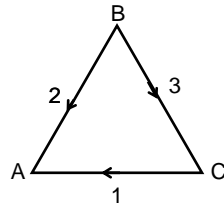
   a) 7A
   b) 12A
   c) 13A
   d) 17A

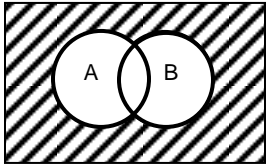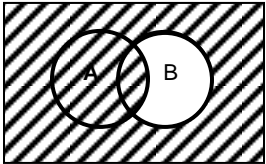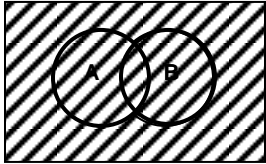9. The steady state current through 1H inductance
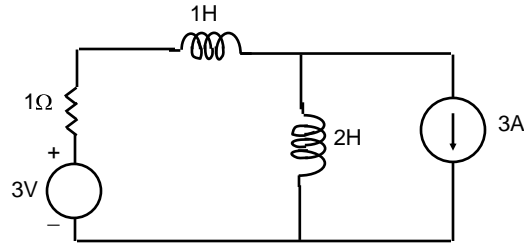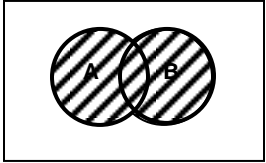

a) zero   b) 5A   c) 3A   d) 6A

10. The total number of 128×8 RAM chips is needed to provide a memory capacity of 2048 bytes is:

a) 11   b) 16   c) 10   d) 8

11. PLL can be used to demodulate

a) DSB-SC signals   b) PCM signals   c) PAM signals   d) FM signals

12.

The incidence matrix of the above graph is:

a) $\begin{bmatrix} -1 & -1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & -1 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 1 & 0 \\ 0 & -1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$ c) $\begin{bmatrix} -1 & 0 & 1 \\ -1 & 1 & - \\ 0 & 1 & -1 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 & -1 \\ 1 & -1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$

13. The final value of $L^{-1}\left[\dfrac{3s+4}{s^3+2s^2+9s}\right]$

a) 4   b) infinity   c) $\dfrac{4}{9}$ d) zero

14. $x(t) = tu(t)$, is a example of

a) Energy signal   b) Power signal   c) Both   d) None

15. The function $\delta(2n)$ is equal to

a) $\delta(n)$ b) $\dfrac{1}{2}\delta(n)$ c) $2\delta(n)$ d) $2\delta\left(\dfrac{n}{2}\right)$

16. Compared to BJT, MOSFET enjoying an advantage of
    a) Able to handle high power
    b) Ease of control
    c) Requires less power in driving it
    d) None of these

17. The Venn diagram representing the Boolean expression $\left[A + \overline{A}.B \right]$ is:

    a)

    b)

    c)

    d)

18. The impulse response of a filter, matched to a rectangular pulse, is:
    a) an attenuator
    b) an equalizer
    c) a low pass filter
    d) a high pass filter

19. The load ripple frequency for a half-wave rectifier system is:
    a) Double of source frequency
    b) Triple of source frequency
    c) Same as source frequency
    d) None of these

20. Which of the following noise becomes important at microwave frequencies?
    a) short noise
    b) transit time noise
    c) flicker noise
    d) thermal noise

21. Which of the following transfer function correspond to a non-minimum phase system?

    a) $\dfrac{s+2}{s^2 + 2s + 1}$
    b) $\dfrac{s+1}{s^2 + 2s - 1}$
    c) $\dfrac{s-1}{s^2 + 2s + 1}$
    d) $\dfrac{s}{s^2 + 2s - 1}$

22. The P.I. (particular integral) of the solution of the differential equation is equal to

    $$D^2 - 6D + 13 \ y = 8e^{3x} \sin 2x$$

    a) $2e^{3x} \cos 2x$
    b) $2e^{3x} \sin 2x$
    c) $-2xe^{3x} \sin 2x$
    d) $-2xe^{3x} \cos 2x$

23. If A, B and C are the events such that $P \ A \ = 0.3, P \ B \ = 0.4, P \ AB' \ = 0.2$. Find $P\left(\dfrac{A}{B}\right)$

    a) 0.1
    b) 0.5
    c) 0.25
    d) None

24. If B is the branch of given graph, then the total number of sub-graph G_s is:

   a) 2^B b) $B+1$ c) $2^B - 1$ d) $2^B - 2$

25. The Laplace transform of $x(t) = u(t) - u(-t)$ is:

   a) $\dfrac{2}{s}$ b) $\dfrac{1}{s}$ c) $2s$ d) None

Q.26 – 55 Carry Two Marks Each.

26. In a given LTI system having input $x(t) = e^{\alpha t}u(-t), \alpha > 0$ and impulse response $h(t) = e^{-\alpha t}u(t)$, the output $y(t)$ for that system looks like
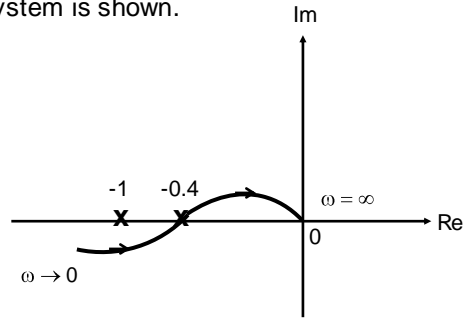
   a)

   b)

   c)
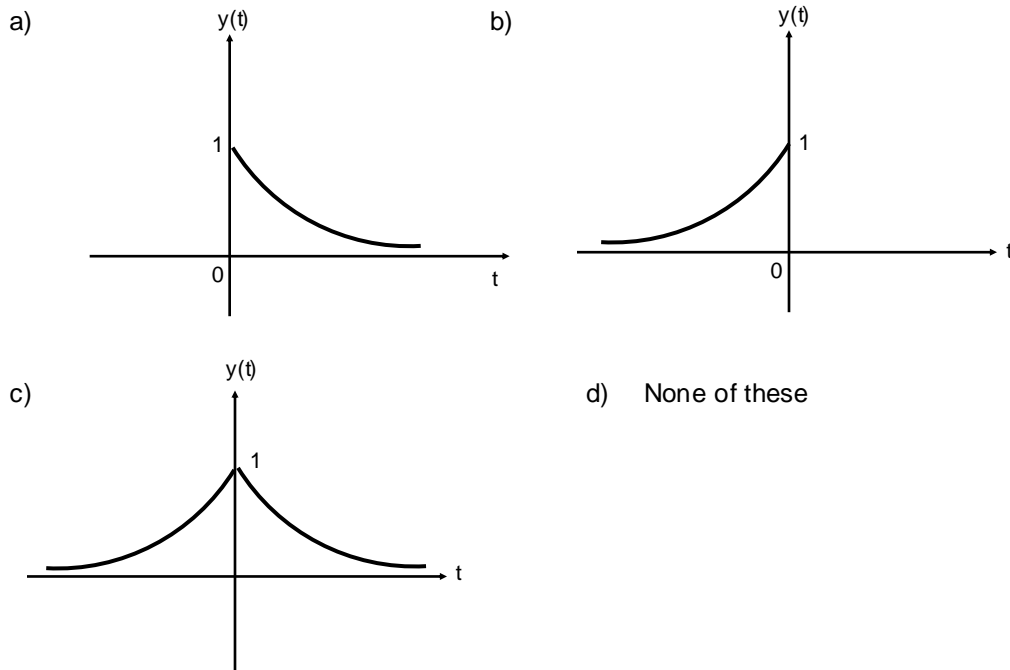
   d) None of these

27. The simplified Boolean function for the following function is:

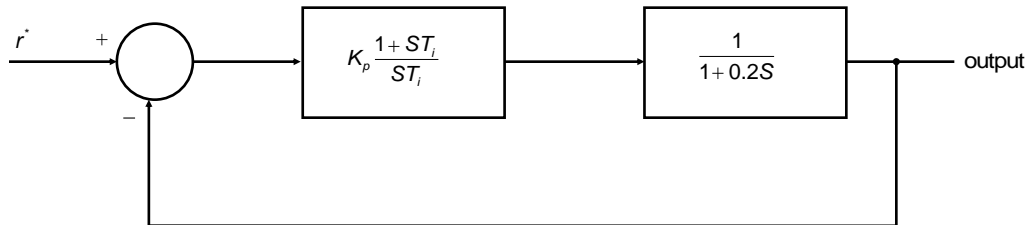 $F(w,x,y,z) = \sum 0,1,2,8,10,11,14,15$

   a) $F = \bar{w}\,\bar{x}\,\bar{y} + \bar{x}\,z + wy$

   b) $F = \bar{w}\,\bar{x}\,\bar{y}\,z + wy + \bar{x}\,\bar{z}$

   c) $F = wxy\bar{z} + \bar{w}\,\bar{y} + xz$

   d) None of these

28. The polar plot of a system is shown.

The system is having

a) positive GM of 4   b) negative GM of 2.5

c) positive GM of 0.4   d) positive GM of 2.5

29. In the following system what should be the parameter of the PI controller to make BW of the entire system to be 100 rad/sec?

a) $K_p = 20, T_i = 2$ b) $K_p = 20, T_i = 0.4$ c) $K_p = 20, T_i = 0.2$ d) $K_p = 100, T_i = 1$

30. Consider a continuous time LTI system having output $y\left(t\right) = \dfrac{1}{T}\int_{t-\frac{T}{2}}^{t+\frac{T}{2}} x\left(\tau\right) d\tau$. The system is:

a) causal, unstable   b) non-causal, stable

c) causal, stable   d) non-causal, unstable

31. Evaluate $\int_{0}^{2\pi} t\sin\left(\dfrac{t}{2}\right)\delta\left(\pi - t\right) dt$

a) 1   b) 0   c) π d) 2π

32. For a control system, having open loop transfer function

$$G\left(s\right) = \dfrac{\left(1 + \dfrac{s}{2}\right)}{s\left(1 + \dfrac{s}{3} + \dfrac{s^2}{64}\right)}$$
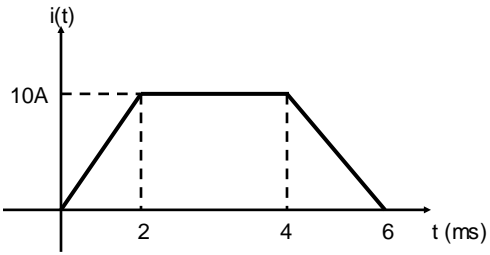
For this system the unity gain BW would be (approx)

a) 2 rad/sec   b) 1.414 rad/sec   c) 5.6 rad/sec   d) None

33. The system matrix of a continuous time system, describe in the state variable form is:

$$A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & -1 \\ 0 & 1 & -2 \end{bmatrix}$$

The system is stable for all values of x and y satisfying

a) $x < \dfrac{1}{2}, y < \dfrac{1}{2}$　　b) $x > \dfrac{1}{2}, y > \dfrac{1}{2}$　　c) $x < 0, y < \dfrac{1}{2}$　　d) $x < 0, y < 2$

34. In comparison to LASER with LED. LASER has the following property
   a) higher emission efficiency　　b) narrow spectral width
   c) no tuning arrangements　　d) provision for confinement

   a) a, b, c　　b) b, c, d　　c) a, b　　d) a, b, c, d

35. DC-emphasis is used
   a) to reduce overall modulation index
   b) to attenuate low modulation frequencies
   c) to attenuate high modulation frequencies
   d) to attenuate mid-band modulation frequencies.

36. A current of the waveform shown in figure passes through a pure inductance of 3 mA. The instantaneous power in W during $0 < t < 2ms$ is:

   a) 25,000 t　　b) 50,000 t　　c) 75,000 t　　d) None

37. A transmission line of 20 ohms characteristic impedance is connected to a load of $20 + j20$. The normalized impedance is:
   a) $400 + j400$　　b) $j20$　　c) $40 + j20$　　d) $1 + j1$

38. A random experiment consists of drawing two cards from a deck in succession. The probability of obtaining two red aces in two draws is:
   a) $\dfrac{1}{52}$　　b) $\dfrac{1}{1326}$　　c) $\dfrac{1}{1352}$　　d) $\dfrac{4}{1326}$

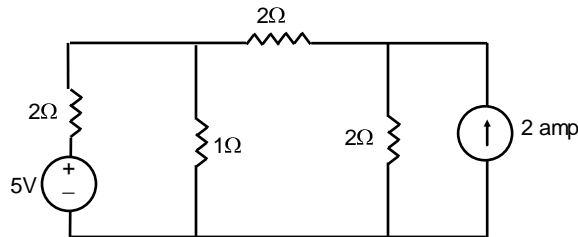39. The RMS value of the periodic wave shown.

a) $\sqrt{\dfrac{3}{2}}A$ b) $\sqrt{\dfrac{2}{3}}A$
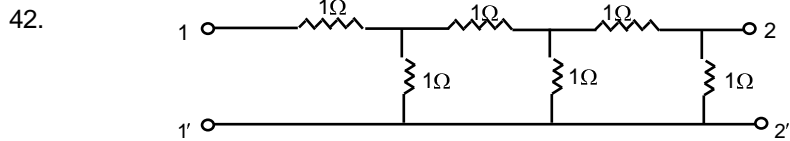
c) $\sqrt{\dfrac{1}{3}}A$ d) $\sqrt{2}A$
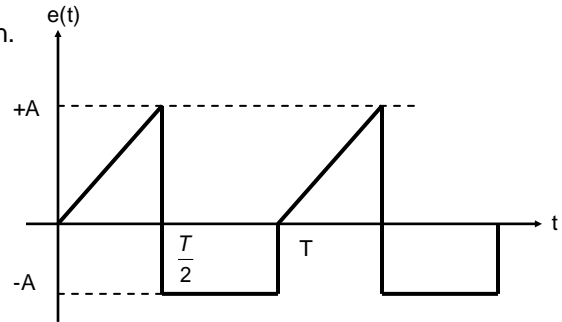
40. $A = \begin{bmatrix} 0 & -2 & 1 \\ 0 & 0 & 3 \\ 0 & 0 & 0 \end{bmatrix}$. Find det A^3

a) 1 b) 2 c) 0 d) None

41. In the given circuit, the current through in the 1Ω resistor
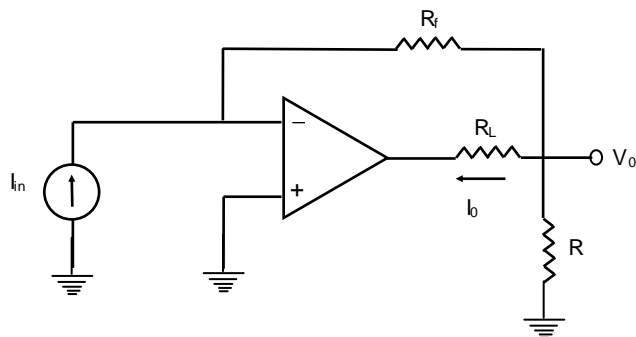

a) 1 amp b) 2 amp c) 2.5 amp d) 4 amp

42.

From the above figure the driving point impedance at point 1 is:
a) 1.625Ω b) 1.825Ω c) 2.46Ω d) 1.125Ω

43. Find the expression for current gain for this amplifier

a) $\dfrac{R_f}{R_L}$

b) $\dfrac{R_L}{R}$

c) $\left(1+\dfrac{R_f}{R_L}\right)$
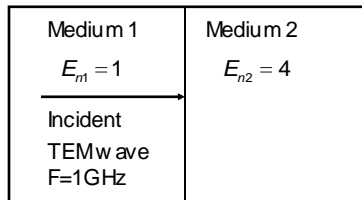
d) $\left(1+\dfrac{R_f}{R}\right)$

44. Under the mapping $W = Z^2$, the straight line $y = 1$ in the Z-plane is mapped onto

a) A straight line   b) A circle   c) A parabola   d) An ellipse

45. $P(r,\theta) + jQ(r,\theta)$ is analytic when

a) $P_r = Q_\theta$ b) $P_\theta = rQ_r$ c) $P_\theta = -rQ_r$ d) $P_r = -Q_\theta$

46. The feedback factor for the circuit
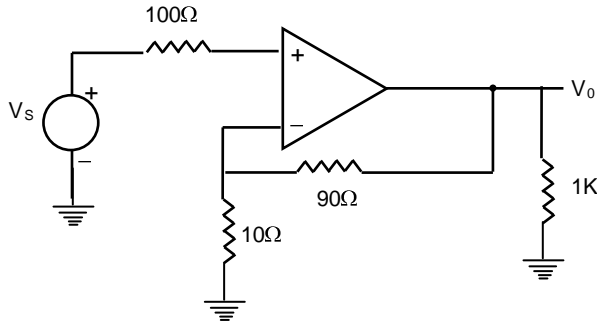
a) $\dfrac{9}{100}$ b) $\dfrac{9}{10}$ c) $\dfrac{1}{9}$ d) $\dfrac{1}{10}$

47.

From the above figure, the wave impedance at Medium 2 is

a) 377Ω b) 188.5Ω c) 754Ω d) 450Ω

Common Data Questions: Q.48 & Q.49

Common Data Questions: Q.No.48 and Q.No.49:

An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation

$$\varphi_{FM}(t) = 10\cos(\omega_c t + 5\sin 3000t + 10\sin 2000\pi t)$$

48. The frequency deviation of the signal is:

a) 12.92 KHz   b) 12.38 KHz   c) 10.94 KHz   d) 14.24 KHz

49. The bandwidth of the signal is:

a) 22.56 KHz   b) 22.88 KHz   c) 26.77 KHz   d) 18.24 KHz

Common Data Questions: Q.50 & Q.51

Common Data Questions: Q.No.50 and Q.No.51:

A zener diode in the circuit is shown in figure below. The minimum and the maximum allowable zener current are 4 mA and 40 mA respectively.
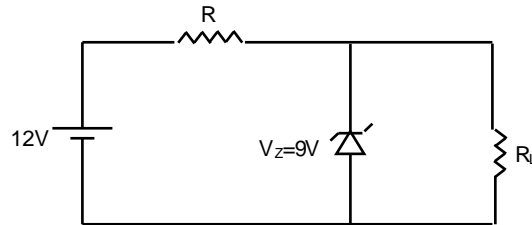
50.   The value of the resistance R is:

   a) 30Ω b) 75Ω c) 100Ω d) 132Ω

51.   The allowable range of resistance R_L

   a) $0 \le R_L < 100$ b) $100 \le R_L < \infty$ c) $\infty > R_L \ge 250$ d) $250 > R_L \ge 75$

Linked Answer Questions: Q.52 & Q.53:

Statement for Linked Answer Questions: Q.52 & Q.53:

The circuit is in steady state for a long time with the switch in position A, after which it is moved to B.
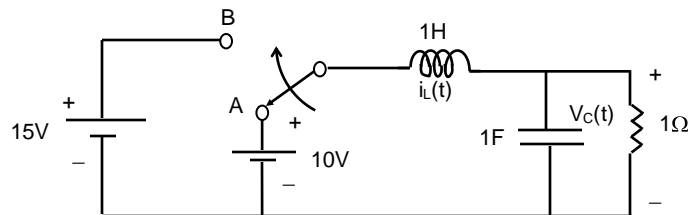
52. $i_L\ 0^-$ is: a)   10 A   b)   5 A   c)   15 A

   d)   25 A

53. $V_c\ 0^-$ is:

   a)   10 V   b)   15 V   c)   5 V   d)   25 V

Linked Answer Questions: Q.54 & Q.55:
Statement for Linked Answer Questions: Q.54 & Q.55:

$$E\ z,t\ = 10^3 \sin\ 6\times10^8\ t - \beta_z\ \hat{a}_y\ \text{V/m}$$

54. When the wave has travelled a distance of $\frac{\lambda}{4}$ along Z-direction, the time 't' is:

   a) 1.31 ns   b) 2.62 ns   c) 3.93 ns   d) 5.24 ns

55. The values of β and λ are

   a) 2 rad/sec. π b) 1 rad/sec, $\frac{\pi}{2}$ c) 4 rad/sec. 2π d) 0.5 rad/sec. π

General Aptitude Questions: Q.56 – Q.65
Q.56 – Q. 60 Carry One Mark Each

In the following question a related pair of CAPITALISED words is followed by four other pairs of words. Choose the pair that best expresses a relationship similar to that in the capitalized pair.

56. **PREMISE : CONCLUSION**

   a) Assumption : Inference   b) Given : Parameter

   c) Hypothesis : Theory   d) Law : Rule

The following question contains six statements followed by four sets of combinations of three. Choose the set in which the statements are most logically related.

57. A. Whales are not fishes   B. Whales are mammals

   C. Whales and fishes live in water   D. No mammals are fishes

   E. Fishes are not mammals   F. Mammals live in water.

   a) ADE   b) BDA   c) CEA   d) FCA

Replace if necessary the underlined phrase with the most suitable choice.

58. Drawing inferences from real life can be <u>erogenous.</u>

   a) erogenous   b) an error   c) erroneous   d) errorgenous

Arrange the sentences a, b, c, and d to form a logical sequence between sentences 1 and 6.

59. 1. Relativity theory has not only affected our conception of particles, but also our picture of the forces between these particles.

   a) This concept is very difficult to visualize.

   b) It is a consequence of the four dimensional space-time character of the sub-atomic world.

   c) In a relativistic description of particle interactions, the forces between the particles are pictured as the exchange of other particles.

   d) A world which neither our intuition nor our language can deal with very well.

   6. Yet it is crucial for an understanding of sub-atomic phenomena.

   a) abcd   b) cabd   c) bdca   d) Dbac

60. Fresh grapes contain 90% water by weight while dried grapes contain 20% water by weight. The weight of dry grapes available from 20 kg of fresh grapes will be

   a) 2.5 kg   b) 2.4 kg   c) 2 kg   d) None of these.

Q.61 – Q. 65 Carry Two Marks Each

61. If *m* and *n* are two integers, both divisible by 5, then which of the following is not necessarily true?

   a) (m + n) is divisible by 10.   b) $(m^2 + n^2)$ is divisible by 25.

   c) (m - n) is divisible by 5.   D) None of these.

The incomplete sentence given below is followed by four choices. Select the one which most logically completes the idea contained in the main sentence.

62. In the Indian education system, the deep-rooted hierarchy is often so rigid that

   a) it is very difficult for a student to address her instructor without a `Mr.' prefix.

   b) informality marks most student-teacher relationships.

   c) there is a possibility of free exchange of information to mutual benefit.

   d) many students erroneously develop a complex for not being `traffic stoppers'.

Directions for question Q.No.63 and Q.No.64: A survey was conducted in a city to determine the choice of channel (DD, BBC and CNN) among viewers in viewing the news. The viewership for these three channels is 80, 22 and 15 percent respectively. Five percent of the respondents do not view the news at all.

63. What is the maximum percent of viewers who watch all the three channels?

   a) 22   b) 15   c) 11   d) None of these.

64. If ten percent of the respondents view DD and CNN and 12 percent view DD and BBC, then what percent of the respondents view only CNN and BBC?

   a) Zero   b) 2

   c) 8   d) Cannot be determined.

65. A thief flees City A in a car towards City B on a stretch of straight road, 300 kms long, at the speed of 60 km/hr. In 15 minutes a police party (X) leaves City A to chase the thief at 65 km/hr.

   If a police party (Y) were to leave city B at the same time as police party X leaving City A to catch the thief at 60 km/hr then which of the following statements is true?

   a) Party Y reaches 37.5 minutes after Party X caught the thief.

   b) Party X and Party Y caught the thief together.

   c) Party X was 20 kms away when the thief was caught.

   d) Party X reaches 37.5 minutes after Party Y has caught the thief.