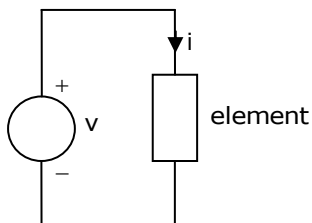


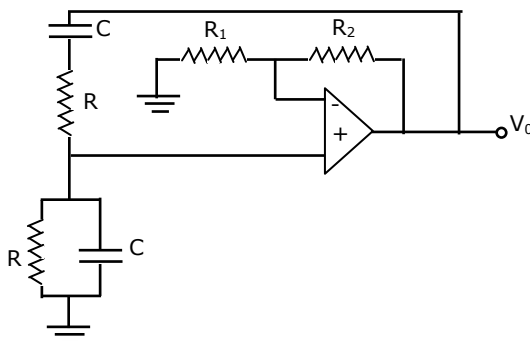
Q. No. 1 – 25 Carry One Mark Each

1. In figure below, if $i = \cos 4t$ and $v = \sin 4t$, then the element is

- (A) Resistor
(B) Capacitor
(C) Inductor
(D) Diode



2. The open-circuit test on a transformer is conducted to obtain
(A) Hysteresis loss only (B) Eddy current loss only
(C) Ohmic loss (D) Core losses
3. Consider the following statements in respect of the Wien-bridge oscillator shown in the figure below.



1. For $R=1$ Kilo Ohm $C = \left(\frac{1}{2\pi}\right) \mu F$, $f=1$ KHz
2. For $R=3$ Kilo Ohm $C = \left(\frac{1}{18\pi}\right) \mu F$, $f=3$ KHz

Which of the statement given above is /are correct?

- (A) 1 only (B) 2 only (C) 1 and 2 (D) neither 1 nor 2

4. In a 25-KVA, 2000/400V, 1- ϕ transformer the iron & full load copper losses are 300W & 400W respectively. Full load efficiency (in %) at unity p.f will be _____.

5. A Transfer Function is given as $H(s) = \frac{k_1 s^2 + k_2 s + k_3}{s^2 + s\left(\frac{\omega_0}{2}\right) + \omega_0^2}$.

Match List I with List II.

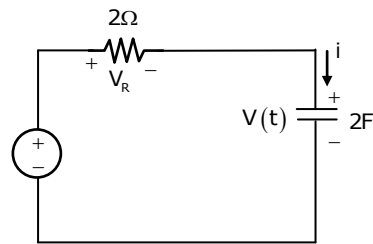
List I		List II	
P	$k_1 = k_3 = 0$	1	HPF
Q	$k_1 = k_2 = 0$	2	BRF
R	$k_2 = k_3 = 0$	3	LPF
S	$k_2 = 0$	4	BPF

- (A) P-3; Q-4; R-1; S-2 (B) P-4; Q-3; R-2; S-1
(C) P-4; Q-3; R-1; S-2 (D) P-1; Q-2; R-3; S-4
6. A 250/400 V 1- ϕ transformer has 2000 primary turns. The number of turns in secondary will be
(A) 1600 (B) 3200 (C) 800 (D) 4000
7. Which of the following statement(s) is/are true?
(a) The capacitance per unit length of a capacitor is equal to the permittivity of the medium
(b) The work to transport a charge around any closed path in a static as well as dynamic field is zero
(A) a only (B) b only (C) both a & b (D) None of these
8. While numerically solving the differential equation $\frac{dy}{dx} - 3x^2y = 0$, $y(0) = 1$ using improved Euler-Cauchy method with a step size of 0.1, the value of y after the first step is
(A) 1.0014 (B) 1.0013 (C) 1.0015 (D) 1.0012
9. A 60 Hz transformer has hysteresis loss to be twice its eddy current loss when operated at rated condition. What will be the effect on core loss when operated at 54 Hz and 90% of rated voltage?
(A) Reduces by 25.5% (B) Increases by 16.6%
(C) Decreases by 13.3% (D) Remains unchanged

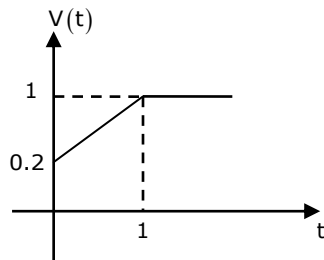
10. If $\mathbf{r}(t) = t^3\mathbf{i} + t\mathbf{j} + t^2\mathbf{k}$ represents the position vector of a moving particle then velocity is
(A) $3t^2\mathbf{i} + \mathbf{j} + 2t\mathbf{k}$ (B) $3t^2\mathbf{i} + \mathbf{j} + 2t\mathbf{k}$ (C) $6t\mathbf{i} + 2\mathbf{k}$ (D) 0

11. Which of the following transformation $\{v = f(z)\}$ reduces $\frac{dz}{dy} + az^5 + bz = 0$ to a linear differential equation? (a and b are constants or functions of y)
(A) $V = z^4$ (B) $V = z^{-4}$ (C) $V = z^3$ (D) $V = z^{-6}$

12. For the given circuit $C = 2F$, $R = 2\Omega$



The voltage function is shown below

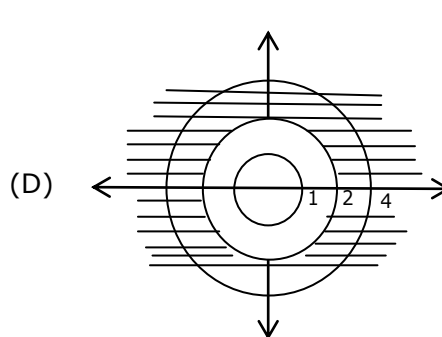
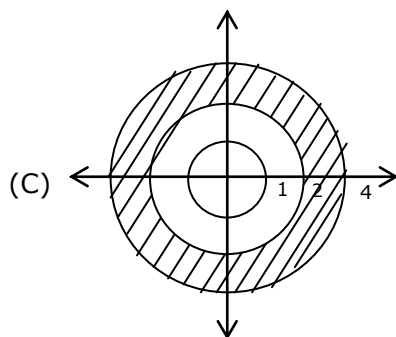
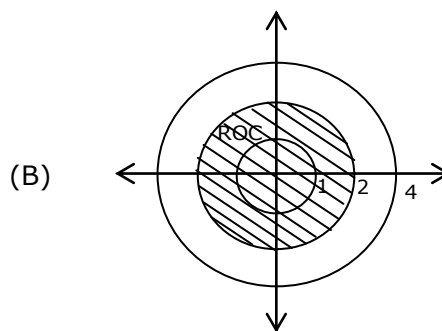
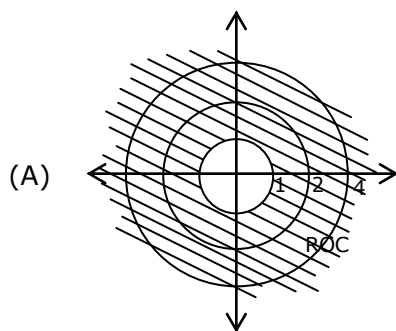


The current $i(t)$ for $0 < t \leq 1S$ is _____ (A)

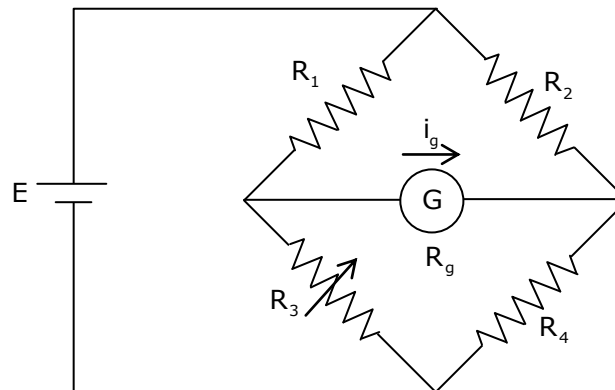
13. Which of the following conditions is not essential for successful parallel operation of 3- ϕ transformer?
(A) The line-voltage ratio must be same.
(B) The transformers should have same polarity.
(C) The transformers must have same KVA rating.
(D) The phase-sequence should be same.
14. In a series RLC circuit, setting $R=0$ will produce
(A) Over-damped response (B) Critically damped response
(C) Under-damped response (D) Un-damped response

15. Compared with a solid conductor of the same radius, corona appears on a stranded conductor at a lower voltage, because stranding
(A) assists ionization
(B) makes the current flow spirally about the axis of the conductor
(C) produces oblique sections to a plane perpendicular to axis the conductor
(D) produces surfaces of smaller radius
16. What is the percentage of reactance of alternator if the capacity is 4 times and voltage is doubled?
(A) 0.5 (B) 0.8 (C) 0.9 (D) Remains same
17. An oscilloscope having $5 \times 5 \text{ cm}^2$ has its own sweep output fed to its input. If x and y plates having same sensitivities then oscilloscope will display a _____.
(A) sweep wave (B) Circle (C) diagonal line (D) Triangular
18. For the signal
$$x(n) = -(4)^n u(-n-1) + u(n) - 2^n u(n)$$

The ROC of the $Z(x(n))$ would be {shaded area}



19.



Find the expression for the galvanometer current for the circuit shown above.

(A) $I_g = \frac{E \left[\frac{R_1}{R_1 + R_3} - \frac{R_2}{R_2 + R_4} \right]}{R_g}$

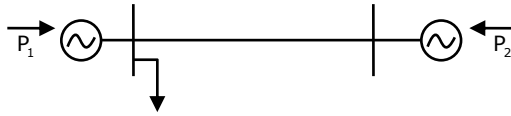
(B) $I_g = \frac{E \left[\frac{R_3}{R_1 + R_3} - \frac{R_4}{R_2 + R_4} \right]}{\frac{R_1 R_3}{R_1 + R_3} + \frac{R_2 R_4}{R_2 + R_4} + R_g}$

(B) $I_g = \text{zero}$

(D) None of these

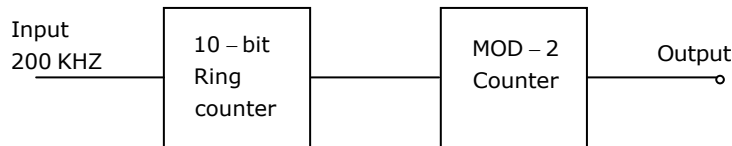
20. A step down chopper circuit is operating at a frequency of 20KHZ on a 220 V d.c supply. The load voltage is 170 V. The conduction period of thyristor (in ms) is _____.
21. A generating station has a maximum demand of 35000 kW and has a connected load of 60000 kW. The number of units generated annually is 23.4×10^7 . The load factor will be _____.
22. A six-pole three phase, 50Hz induction motor has a rotor resistance and rotor reactance of 0.025Ω and 0.12Ω respectively at standstill. The external resistance to be added (in ohms) in the rotor circuit to get 80% of maximum torque at starting is _____.
23. A 415/110 V, single phase transformer has an equivalent resistance of 0.04 pu and equivalent inductance of 0.08 pu. Find the power factor for which the voltage regulation is maximum and the secondary voltage for full load when primary is excited with 415 V?
- (A) 0.447, 100V (B) 0.66, 110V (C) 0.77, 100V (D) 0.66, 100V

24. A. P.S. Network is shown below



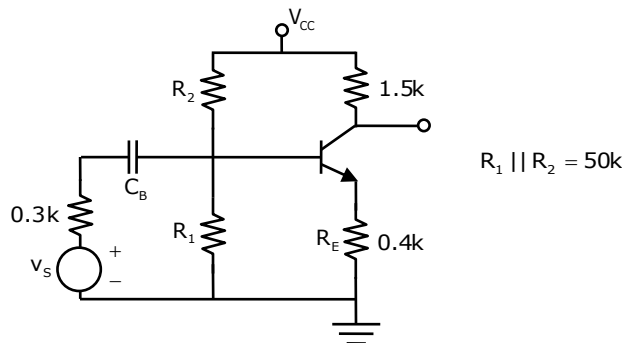
$P_1 = 125\text{MW}$, $P_2 = 100\text{MW}$ and $B_{22} = 10^{-3}$ (loss less coefficient), then the penalty factor of generator 2 is _____.

25. If the ring counter shown in figure is applied with 200 KHz signal, then the frequency at output of the shown arrangement is _____ (KHz)



Q. No. 26 – 51 Carry Two Marks Each

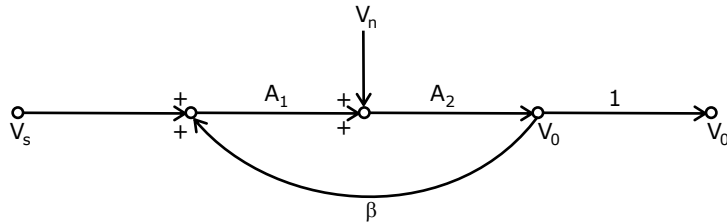
26. A spherical Gaussian surface has radius of 10 m centred of (3, 3, 3). The electric flux density is defined as $2y^2z^2\hat{a}_x + 3xy^2z^2\hat{a}_y + 2xyz\hat{a}_z$ pC/m². The total charge (in μC .) contained in the sphere would be _____.
27. For the circuit shown below, the lower cross over frequency of the amplifier is $f_L = 20\text{Hz}$. The transistor parameters are $r_\pi = 2\text{k}$ and $\beta_0 = 150$. The value of C_B is



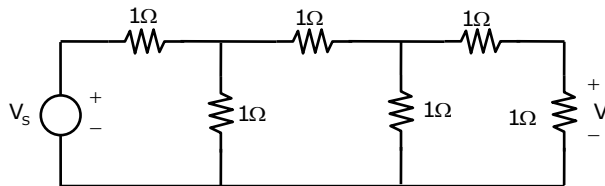
- (A) $0.8\mu\text{F}$ (B) $0.28\mu\text{F}$ (C) $0.6\mu\text{F}$ (D) $1\mu\text{F}$
28. If centroid point is -2 and angle of asymptotes are 90° and 270° and there are no zeroes in the system, then transfer function is

- (A) $\frac{K}{(S+1)(S+3)}$ (B) $\frac{K}{S(S+2)}$ (C) $\frac{K}{S(S+2)^2}$ (D) $\frac{K}{S^2(S+4)}$

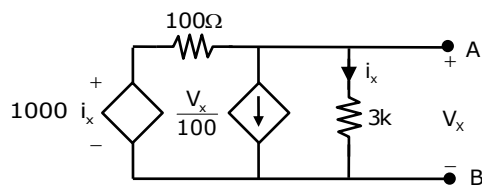
29. What is the effect of β on signal to noise ratio at the output for the signal flow diagram shown below?



- (A) Increases with increase in β (B) Decreases with increase in β
(C) Independent of β
(D) Increase or decreases depending upon sign of β
30. The voltage across the last resistor is V . All the resistors are unity. Then $V_s =$ _____ (V)



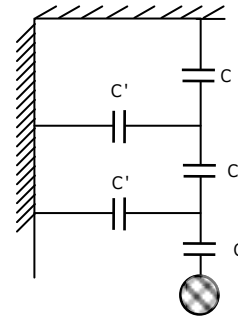
31. The Thevenin's resistance between the terminals A and B is



- (A) 40.57Ω (B) 58.82Ω (C) 51Ω (D) 46.13Ω
32. A DC series motor is running a constant – torque load at 800 rpm taking 30A from 200V supply. The field resistance and armature resistance are 0.05Ω & 0.01Ω respectively. A diverter of 0.06Ω is placed across the field resistance to increase the speed. If the field flux is unsaturated, the new speed in rpm is _____.

33. Which of the following is/are true?
 (1) $(A+C)(A+B)(B+C)(B+D)=AB+CD$
 (2) $A \oplus B \oplus C = A \odot B \odot C$
 (A) 1 only (B) 2 only (C) both 1, 2 (D) None of these
34. The maximum voltage (in KV) that the string of three insulators can withstand if maximum voltage per unit is 20 kV is _____.

$$(C' = C/6)$$

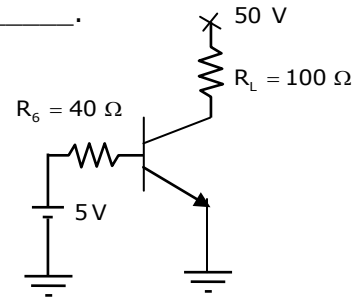


35. A $1-\phi$, concentric cable has $l=1\text{km}$, $C=0.3\mu\text{F/km}$, $\epsilon_r = 3.5$, $d=1.5\text{cm}$, 66kV, 50 Hz. Find the diameter of the cable.
 (A) 1.85 cm (B) 2.1 cm (C) 2.5 cm (D) 2.87 cm
36. The number of 2×1 multiplex's required to realize an 8×1 multiplex is
 (A) 4 (B) 5 (C) 7 (D) 8
37. It is observed that number of industrial injuries per week in an industry follows the Poisson distribution with mean 0.4. Then in a particular week, what is the probability that there is more than two injuries?
 (A) 0.9921 (B) 0.0079 (C) 0.079 (D) None
38. The area bounded by $2y = x^2$ and $x = y - 4$ is
 (A) 6 (B) 18 (C) 12 (D) 20
39. The value of integral $\int_C \frac{\sin z}{z^2 + iz + 6} dz$, in the square with vertices $(1, 0)$, $(0, 1)$, $(-1, 0)$, $(0, -1)$ is
 (A) $2\pi i$ (B) $-2\pi i$ (C) $2\pi i \sin 1$ (D) 0

40. The power delivered to the load resistance R_L is _____.

β of the transistor is =20

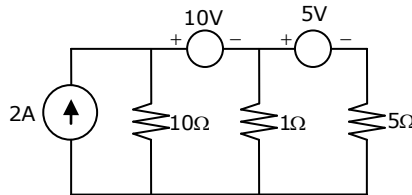
$V_{BE(Active)} = 0.7V$, $V_{CE(saturation)} = 0.2V$,



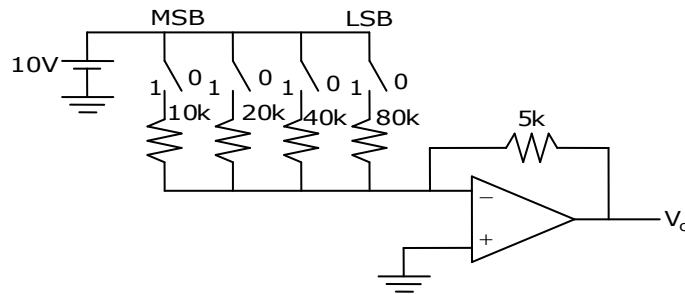
- (A) 462.25W (B) 62.5W (C) 24.8W (D) 0W
41. Let $x[n] = \{4, -2, 4, -6\}$. Its even and odd parts are
- (A) $\{1, -1, 2, -3\}$, $\{2, 2, 0, -2, -2\}$ (B) $\{-2, 4, 4, 4, -2\}$, $\{-2, -2, 0, 2, 2\}$
- (C) $\{1, -2, 2, -2, 1\}$, $\{1, 1, 0, -1, 1\}$ (D) $\{2, -4, 4, -4, 2\}$, $\{2, 2, 0, -2, -2\}$
42. A heat sink circuit has been designed for BJT. The parameters are
 θ_{JS} = Thermal resistance of Junction to sink = 0.7°C/W ,
 $T_{ambient} = 40^\circ\text{C}$.
 For a loss of 40W in device, the junction reaches the maximum temperature of 120°C . The heat sink has been designed with these values. What will be junction temperature when the loss in the device is 25W?
- (A) 120°C (B) 92°C (C) 72.5°C (D) 90°C
43. A $1-\phi$, 220V energy meter disc makes 5329.5 revolutions when meter has a constant load of 10A passing through it for 6 hours at 0.85 p.f. Calculate the power factor of the load if the number of revolutions made are 2375 for same operating voltage and a current of 12A for 4 hours.
- (A) 0.4734 (B) 0.5265 (C) 0.8939 (D) 0.9989
44. A moving coil instrument gives a full scale deflection with a current of 5mA. The resistance of the instrument is 30Ω . A manganin shunt is used to extend its range from 5 mA to 100 mA. Calculate the change in meter current caused by a 25°C rise in temperature when the copper coil of moving coil instrument is connected directly across the manganin shunt. Given the temperature coefficient of copper and manganin are $0.004/^\circ\text{C}$ and $0.00015/^\circ\text{C}$ respectively.
- (A) 0.417 mA (B) -0.417 mA (C) 0.492 mA (D) -0.492 mA

45. Consider a half wave rectifier using capacitor filter fed by a 60 Hz sinusoidal wave having a peak value of $V_p = 100$ V. The value of the capacitance C that will result in a peak-to-peak ripple of 2V for a load resistance of $10\text{K}\Omega$ is _____ (μF).

46. The power dissipated in the 5Ω resistor for the circuit shown below is _____ (W).



47. A 4-bit resistor network based D/A converter is shown in the figure. The output corresponding to the number 1010 is _____ (V)



Common Data Questions: 48 & 49

A unity negative feedback control system has open loop transfer function

$$G(S) = \frac{K}{S(S+40)}$$

48. Find the value of α in PI controller whose transfer function is $G_c(S) = \left(\frac{S+\alpha}{S} \right)$

Such that (i) $M_p = 30\%$ and (ii) $t_s = 2\text{ sec}$

- (A) 5.4 (B) 6.4 (C) 7.4 (D) 8.4

A unity negative feedback control system has open loop transfer function

$$G(S) = \frac{K}{S(S + 40)}$$

49. The approximate value of K in compensated system will be _____.
(A) 150 (B) 175 (C) 200 (D) 225

Common Data Questions: 50 & 51

An amplifier without feedback gives a fundamental output of 36 V with 7% second harmonic distortion when the input is 0.026 V.

50. If the β in the negative feedback amplifier is $5.55 \times 10^{-3}\%$, then output voltage is _____ (V)

An amplifier without feedback gives a fundamental output of 36 V with 7% second harmonic distortion when the input is 0.026 V.

51. If the fundamental output is maintained at 36 V and the second harmonic distortion is reduced to 1%, then the input voltage is _____ (mV)

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

Statement for Linked Answer Questions: 52 & 53

A Crompton's potentiometer consists of a resistance dial having 10 steps of 10Ω each & a series connected slide wire of 10Ω divided into 100 divisions. The working current of the potentiometer is set at 15 mA.

52. What will be the voltage representing each division?
(A) 0.095 V (B) 0.0015 V (C) 0.035 V (D) 0.0066

A Crompton's potentiometer consists of a resistance dial having 10 steps of 10Ω each & a series connected slide wire of 10Ω divided into 100 divisions. The working current of the potentiometer is set at 15 mA.

53. If each division of slide wire can be read accurately upto $\frac{1}{3}$ rd of its span, determine the resolution of the potentiometer.
(A) 0.0095 V (B) 0.0027 V (C) 0.0013 V (D) 0.0005 V

Statement for Linked Answer Questions: 54 & 55

For an LPF, an input $x(t) = e^{-200\pi t}u(t)$ is being applied. The filter transfer function is $H(j\omega) = \begin{cases} 1 & |\omega| \leq \omega_c \\ 0 & \text{else where} \end{cases}$.

54. The energy of output of the filter is
(A) $\frac{1}{200\pi^2} \tan^{-1}\left(\frac{f_c}{200}\right)$ (B) $\frac{1}{100\pi^2} \tan^{-1}\left(\frac{f_c}{100}\right)$
(C) $\frac{1}{200\pi^2} \tan^{-1}\left(\frac{f_c}{100}\right)$ (D) $\frac{1}{100\pi^2} \tan^{-1}\left(\frac{f_c}{200}\right)$

For an LPF, an input $x(t) = e^{-200\pi t}u(t)$ is being applied. The filter transfer function is $H(j\omega) = \begin{cases} 1 & |\omega| \leq \omega_c \\ 0 & \text{else where} \end{cases}$.

55. The cut off frequency for which the filter passes one fourth of energy of input to output would be
(A) 100 Hz (B) 41.42 Hz
(C) 82.84 Hz (D) None of these

Q. No. 56 – 60 Carry One Mark Each

56. His attempt to make fun of the situation was considered to be in bad taste and in the extreme.
(A) fertile (B) frequent (C) febrile (D) facetious
57. When we eventually arrived at the hotel, we had to our luggage at reception.
(A) sort out (B) sort of (C) sort in (D) sort by

Choose the appropriate antonyms for the given words given below:

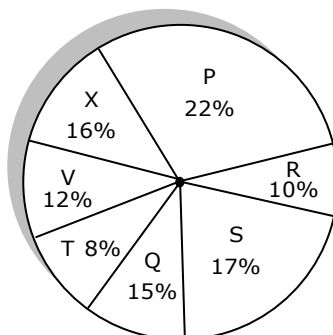
58. Gregarious
(A) aloof (B) triangular (C) timid (D) honorable
59. Wild are found in many parts of the world including North and South America, Europe and Asia.
(A) boors (B) bores (C) boars (D) bowls
60. A can do work in 12 days & B can do in 16 days. If they work together for 4 days, then fraction of work left is
(A) $\frac{7}{12}$ (B) $\frac{5}{12}$ (C) $\frac{11}{12}$ (D) $\frac{5}{6}$

Q. No. 61 – 65 Carry Two Marks Each

61. X: It is responsibility of parents to teach their children
Y: It is the responsibility of teachers to teach their students.
Find out the argument which will strengthen "Y":
(A) All the teachers are educated
(B) All the parents are educated
(C) Teachers know the methods of teaching
(D) Educated parents can teach their children well
62. A two digit number is such that the product of the digits is 8. When 18 is added to number then digits get reversed. The number is
(A) 24 (B) 42 (C) 18 (D) None of these
63. A, B & C enter into a partnership in the ratio of $\frac{7}{2} : \frac{4}{3} : \frac{6}{5}$. After 4 months, A increases his share 50%. If total profit at the end of one year be Rs.21,600, then B's share in the profit is
(A) 6000 (B) 4000 (C) 8000 (D) 9000
64. Apple worth of Rs.75 per kg and of Rs. 85 per kg are mixed with a third variety in the ratio 1: 1: 2. If the mixture is worth of Rs. 115 per kg, the price of the third variety per kg will be
(A) 150 (B) 175.50 (C) 175 (D) 80

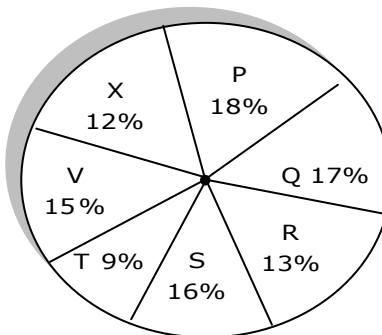
65. Distribution of candidates who were enrolled for MBA entrance exam from different institutes.

Candidates Enrolled = 9000



The candidates (out of those enrolled) who passed exam in different institutes:

Candidates who passed the exam = 6000



The number of candidates passed from institutes S & P together exceeds the number of candidates enrolled from institute T & R together are

- (A) 320 (B) 560 (C) 450 (D) 420