

Instructions

- i) The question paper has five parts A, B, C, D and E. Answer all the parts
- ii) Part A carries 20 marks, part B carries 12 marks, part C carries 15 marks, part D carries 25 marks and part E carries 8 marks
- iii) Write the question number properly as indicated in the question paper

PART -A

I. Choose the correct answer (each question carries one mark)

5 × 1 = 5

1. If $A = \begin{bmatrix} 4 \\ -3 \end{bmatrix}$ $B = [3 \ 1 \ 5]$, then AB is
 - a) $\begin{bmatrix} 12 & 4 & 20 \\ 9 & 3 & -15 \end{bmatrix}$
 - b) $\begin{bmatrix} 12 & 4 & 20 \\ -9 & -3 & -15 \end{bmatrix}$
 - c) $\begin{bmatrix} 36 \\ -27 \end{bmatrix}$
 - d) $\begin{bmatrix} 12 & 1 & 5 \\ -9 & 1 & 5 \end{bmatrix}$
2. If A and B are independent events then $P\left(\frac{A}{B}\right)$ is
 - a) $P(A)$
 - b) $P(A)'$
 - c) $P(B)'$
 - d) $P(B)$
3. The triplicate ratio of 2:3 is
 - a) 6:9
 - b) 9:6
 - c) 4:
 - d) 8:27
4. If $\cos A = \frac{\sqrt{3}}{2}$ then $\cos 2A$ is
 - a) $\frac{1}{2}$
 - b) $\frac{1}{\sqrt{2}}$
 - c) $\sqrt{3}$
 - d) $\sqrt{2}$
5. Value of $\lim_{n \rightarrow \infty} \left(1 + \frac{2}{n}\right)^n$ is
 - a) $\log 2$
 - b) e^2
 - c) 2
 - d) $2\log 2$

II. Match the following

5 × 1 = 5

6. i) $\begin{vmatrix} 1 & 5 & 7 \\ 5 & 25 & 35 \\ 3 & -1 & 0 \end{vmatrix}$
 - a) 1
 - b) 2
- ii) If $5p_r = 60$, then r is
 - c) 0
 - d) 3
- iii) mean proportional of 2 and 8 is
 - e) 16
 - f) 4
- iv) If $f(x) = 2x + \sin a + \log b$, then $f'(x)$ is
- v) $\int_0^{\frac{\pi}{2}} \sin x \, dx$ is

III. For question numbers 7 to 11 choose the appropriate answer from the answers given below

$(\sim p \rightarrow \sim q, 0, \frac{\log(7x+8)}{7}, \sim p \wedge \sim q, 45, 2520)$

7. The number of straight lines can be formed from 10 points if no three of them are collinear is _____
8. The number of ways in which 8 different coloured beads can be strung together to form necklace _____
9. Negation of $\sim p \rightarrow q$
10. If $y = \log(e^2)$, dy/dx is
11. Evaluate $\int \frac{1}{7x+8} \, dx$

IV. Answer the following questions**5 × 1 = 5**

12. If $A = \begin{bmatrix} 3 & -1 \\ 4 & 5 \end{bmatrix}$. Find X such that $A - 2X = \begin{bmatrix} 1 & 4 \\ 2 & -3 \end{bmatrix}$
13. 500 workers can finish a work in 8 days, how many workers will finish the same work in 5 days?
14. Find the value of $\sin 15^\circ$
15. If $y = x^x$ find dy/dx
16. Evaluate $\int \tan^2 x \, dx$

PART -B**V. Answer any SIX of the following questions****6 × 2 = 12**

17. In the word "COMMITTEE" find the number of permutations if
- begin with T and end with T
 - all vowels together
18. A team of 8 players has to be selected from 14 players. In how many ways the selection can be made if
- two particular players are always together
 - two particular players are always excluded
19. Three fair coins tossed simultaneously. Find the probability of
- getting atmost one head
 - getting atleast two head
20. An article is sold at 40% gain on the cost price. Find the ratio of selling price and cost price
21. A mixture contains milk and water in the ratio 5:1, on adding 5 litres of water, the ratio of milk and water becomes 5:2. Find the quantity of milk in the original mixture.
22. The BD and TD on a sum of money due 3 months are ₹154.50 and ₹150 respectively. Find the sum of money and the rate of interest.
23. Find the equation of directrix and focus of the parabola $x^2 = 8y$
24. Find the equation of the parabola given that its vertex is(0,0) axis is Y-axis and passes through $(-1, -3)$
25. Evaluate $\int \frac{5^x \log 5}{(5^x + 3)^7} \, dx$
26. Evaluate $\int_0^{\frac{\pi}{2}} x \sin x \, dx$
27. Find the area bounded by the curve $x = 2y^2$, y axis and the ordinates $y = 2$ and $y = 4$

PART- C**VI. Answer any FIVE of the following questions****5 × 3 = 15**

28.
$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$
29. A bill for ₹3500 due for 3 months was drawn on 27 march 2012 and was discounted on 18th April 2012 at the rate of 7% per annum, find the bankers discount and discounted value of the bill.
30. 'A' invests a sum of money 5.5% stock at 90 & 'B' an equal sum in 3.5% stock. If A's income is 10% more than B's find the price of 3.5% stock.
31. If the rate of sales tax is 5%, the person has to pay ₹7140 for the steel cupboard. What amount the person has to pay if the ST is increased by 2%?
32. If $x = e^t(\cos t + \sin t)$ $y = e^t(\cos t - \sin t)$. Show that $\frac{dy}{dx} = -\tan t$
33. The Surface area of spherical soap bubble increasing at the rate of 0.6 cm²/sec. Find the rate at which its volume is increasing when its radius is 3cm.
34. Evaluate $\int \frac{2x}{2x+3} \, dx$

PART -D**VI. Answer any FIVE following question****5 × 5 = 25**

35. Solve the system of linear equations using matrix method

$$x + y + z = 5, \quad 2x + y - z = 2, \quad 2x - y + z = 2$$

36. Find the term independent of x in $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$ 37. Resolve $\frac{x}{(1+2x)^2(1-3x)}$ into partial fractions.

38. Verify the following proposition for logical equivalence

$$p \vee (q \wedge r) \text{ and } (p \vee q) \wedge (p \vee r)$$

39. An engineering company has 80% learning effect and spends 1000 hours to produce one lot of the product. Estimate the labour cost of producing 8 lots of the product if the labour cost is ₹40 per hour.

40. Solve the LLP graphically

$$\text{Maximise } Z = 10500x + 9000y$$

Subject to the constraints

$$x + y \leq 50$$

$$2x + y \leq 80$$

$$x, y \geq 0$$

41. Prove that $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$

42. Find the equation of the circle passing through the points

$$(1, -4), (5, 2) \text{ and has its centre on the line } x - 2y + 9 = 0$$

43. Evaluate $\lim_{x \rightarrow 2} \left[\frac{1}{x-2} - \frac{2(2x-3)}{x^3-3x^2+2x} \right]$ **PART-E****VII. Answer any TWO of the following questions****2 × 4 = 8**44. From the top of the cliff the angles of depression of two boats in the same vertical plane as the observer are 30° and 45° . If the distance between the boats is 100 metres, find the height of the cliff.45. If $y = \log(x - \sqrt{x^2 + 1})$ Show that $(x^2 + 1) + y_2 + xy_1 = 0$ 46. Let the demand function of an article be $p = 75 - 2x$ and the cost function be

$$C(x) = 350 + 12x + \frac{x^2}{4}. \text{ Find the number of units and the price at which the total profit is maximum.}$$
