

13. The money that a person will get by selling ₹6000 stock at 5% stock at 20 premium is _____
14. A person purchased a bicycle costing ₹12,000 at 6% sales tax. The total amount payable is _____
15. The value of $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x - 2}$ is _____
16. Find the truth value of “if $\sqrt{2}$ is irrational then $\sqrt{2}$ is a real number.
17. Define Discount period.
18. Define Learning curve ratio.
19. Find the equation of directrix for $x^2 = 6y$.
20. According to the law of motion of a particle if $S = t^3 - 6t^2 + 9t + 8$, find its initial velocity.

PART – B

II. Answer any NINE of the following

$2 \times 9 = 18$

21. If $\begin{bmatrix} 2 & 3 \\ 7 & 5 \end{bmatrix} + \begin{bmatrix} 2 & x - 2 \\ y - 1 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 1 \\ 7 & 10 \end{bmatrix}$. Find x and y .
22. In how many ways the letters of the word “ACCOUNTANT” be arranged? In how many of them vowels are always together?
23. A die is thrown twice and the sum of the numbers appearing is observed to be 9. What is the conditional probability that the number 4 has appeared at least once?
24. If p , q and r are propositions with truth values F, T and F respectively then find the truth value of the compound proposition of $(\sim p \rightarrow q) \vee r$
25. Three numbers are in the ratio 2:3:4. If the sum of their squares is 1856. Find the numbers.
26. The present worth of a bill due sometime is ₹1100 and TD on the bill is ₹110. Find BD and BG.
27. Prove that $\frac{\sin 2\alpha + \sin 3\alpha}{\cos 2\alpha - \cos 3\alpha} = \cot\left(\frac{\alpha}{2}\right)$
28. Prove that $\sec(45^\circ + A) \cdot \sec(45^\circ - A) = 2\sec A$
29. Find the equation of LR and coordinates of ends of LR of $y^2 = -12x$
30. Find k if $f(x) = \begin{cases} \frac{e^{2x} - 1}{2x} & x \neq 0 \\ \frac{k+x}{2} & x = 0 \end{cases}$ is continuous at $x = 0$
31. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots \infty}}}$ then prove that $\frac{dy}{dx} = \frac{\cos x}{2y - 1}$
32. Street lamp is hung 12 feet above a straight horizontal floor on which a man of 5 feet is walking, how fast his shadow lengthening when he is walking away from the lamp post at the rate of 175ft/min. Also find the rate at which the tip of the shadow is increasing.
33. Evaluate $\int \sin^3 x \, dx$
34. Evaluate $\int \sin^3 x \cdot \cos x \, dx$

PART -C

III. Answer any NINE of the following

$3 \times 9 = 27$

35. If $A = \begin{bmatrix} 1 & 3 \\ 1 & 0 \end{bmatrix}$ Prove that $A^2 - A - 3I = 0$.
36. Solve for x if $\begin{vmatrix} 2+x & 3 & -4 \\ 2 & 3+x & -4 \\ 2 & 3 & -4+x \end{vmatrix} = 0$
37. From a class of 9 boys and 7 girls, 12 students are to be chosen for a competition which includes at least 6 boys and at least 4 girls. In how many ways can this be done if a particular boy is always included?

38. A bag contains 6 red, 4 white and 2 black balls. 2 balls are drawn at random, what is the probability that the ball drawn are?
 a) Both red b) 1 white and 1 black c) same colour
39. A jar contains two liquids X and Y in the ratio 7:5. When 6 litres of the mixture is drawn and the jar is filled with the same quantity of Y, the ratio of X and Y becomes 7:9. Find the quantity X in the jar initially.
40. A bill of ₹5000 drawn on 14-4-1998 at 3 months was discounted on 1-5-1998 at 12% p.a. For what sum was the bill discounted and how much has the banker gained in this?
41. 'A' invests a sum of money in 5.5% stock at 90 and '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.
42. A shopkeeper bought a TV at a discount of 30% of the listed price of ₹24,000. The shopkeeper offers a discount of 10% of the listed price to the customer. If the VAT is 10% find
 a) The amount paid by the customer
 b) The VAT to be paid by the shopkeeper.
43. Find the equation of the parabola given that its vertex is (0,0), axis is x-axis and passes through (2,3).
44. If $x = a \cos(\log t)$, $y = a \log(\cos t)$ find $\frac{dy}{dx}$
45. Find the maxima and minima of the function
 $f(x) = 3x^3 - 9x^2 - 27x + 30$.
46. The surface area of a spherical soap bubble increasing at the rate of $0.6 \text{ cm}^2/\text{sec}$. Find the rate at which its volume is increasing when its radius is 3cm.
47. Evaluate $\int \frac{1}{\sqrt{x} + \sqrt{1+x}} dx$
48. Evaluate $\int x \operatorname{cosec}^2 x dx$

PART-D

IV. Answer any FIVE of the following

5 × 5 = 25

49. Verify $A \cdot \operatorname{adj}A = \operatorname{adj}A \cdot A = |A| \cdot I$ for the following matrix

$$\begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 7 \\ 1 & -1 & 1 \end{bmatrix}$$
50. Find the term independent of x in $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$
51. Resolve into partial fractions: $\frac{2x^2 + 16x + 29}{(x+3)^2(x+4)}$
52. Verify the compound proposition $(p \rightarrow q) \leftrightarrow (\sim p \rightarrow \sim q)$ is a tautology or contradiction or neither.
53. 4 men or 12 boys can do a piece of work in 5 days by working 8 hours per day. In how many days 2 men and 4 boys can do the same piece of work working 12 hours a day?
54. An engineering company has 80% learning effect and spends 500 hours for the prototype. Estimate the labour cost of producing 7 engines of new order if the labour cost is ₹40 per hour.
55. Maximise $z = 60x + 40y$
 Subject to the constraints $x \leq 25$, $y \leq 35$, $2x + y \leq 60$, $x \geq 0$, $y \geq 0$.
56. If $A + B + C = 180$.
 Prove that $\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cdot \cos B \cdot \sin C$
57. If $x^2 - xy + y^2 = a^2$ then show that $y_2 = \frac{6a^2}{(x-2y)^3}$
58. Find the area bounded by the parabola $y^2 = 4x$ and the line

$$y = 2x - 4.$$

PART- E

V. Answer the following

10 × 1 = 10

59. Show that the points (0,0), (1,1), (5, -5), (6, -4) are concyclic

(6)

OR

If the angle θ is measured in radians prove that $\lim_{\theta \rightarrow 0} \frac{\sin\theta}{\theta} = 1$

(6)

60. The angle of elevation of the summit of a hill from the top and the bottom of a tower are 30° and 60° respectively. If the height of the tower is h , show that the height of the hill is $\frac{3h}{2}$

(4)

OR

Find the value of $(99)^5$ using binomial theorem

(4)