Vidya Vikas Mandal's

Std : XII Ramacrisna Madeva Salgaocar Higher Secondary School Dur: 3 hr

Date : 10/10/2025 Margao – Goa Marks : 80

First Term Examination

Subject : MATHEMATICS AND STATISTICS

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1. The question paper consists of 36 questions.
2. Question number 1 to 8 are multiple choice type question of one mark each.
3. Question number 9 to 16 are very short answer type question of one mark each.
4. Question numbers 17 to 22 are short answer type -I question of two marks each.
5. Question numbers 23 to 28 are short answer type -II question of three marks each.
6. Question numbers 29 to 34 are Long answer type -I question of four marks each.
7. Question numbers 35 to 36 are Long answer type -I question of five marks each.
8. There is no overall choice in the paper. However internal choice is provided in 2 question of 4 marks and in 2 question of 5 marks.
9. Use of calculators is not permitted.
10. Graph should be drawn on the answer paper only.

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1. A square matrix is invertible i.e A^{-1} exist if and only if matrix A is - - - - .
   (A) Singular Matrix
   (B) Skew-symmetric Matrix
   (C) Non- Singular Matrix
   (D) Symmetric Matrix

2. If x = 2t+3 and y =t^2 then $\frac{dy}{dx}$ = ----- .

(A) t

(B) $\frac{t}{2}$

(C) $\frac{t}{3}$

(D) $\frac{t}{4}$

3. A relation R on the set of real numbers defined as R ={ (a,b): $a^2 = b^2$} is -----.

(A) Symmetric and transitive but not reflexive
(B) Reflexive and symmetric but not transitive
(C) Reflexive and transitive but not symmetric
(D) Reflexive, transitive and symmetric.

4. For any matrix A ,$(A^T)^T$ = -----.

(A) A^T
(B) zero matrix
(C) A
(D) Identity Matrix

5. If $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$, then value of x is-------.

(A) 1
(B) 2
(C) 3
(D) 4

6. The difference between interest on face value and interest on present value is called ----

(A) True discount
(B) Bankers discount
(C) Discounted value
(D) Bankers gain

7. The instantaneous rate of change of total cost at any level of output is called ----
   (A) Marginal Cost
   (B) Average Cost
   (C) Total Cost
   (D) Marginal Average Cost

8. A firm paid Rs 25,000 as rent of its office and Rs15,200 as the interest of the loan taken to produce x units of commodity. If the variable cost of production per unit is Rs 8, the Cost function C(x) is ----
   (A) 15208+25000x
   (B) 15200+25008x
   (C) 40,200+8x
   (D) 25,000+15208x

9. Define a Diagonal matrix.

10. Define True Discount.

11. Define Gaining Ratio.

12. If the Profit function of a company is given as P(x) = 7x – 16100, where x is the number of units sold. Find the break-even point.

13. If matrix A = $\begin{bmatrix} 7 & 1 \\ 2 & x \end{bmatrix}$ is a singular matrix. Find the value of x.

14. Define Independent Events.

15. The total revenue received from the sale of x units of a product is given by $R(x) = 20x - 0.5x^2$. Find Marginal Revenue.

16. Differentiate $y = e^{2x+3} + 3^{1-x^2}$ w.r.t x.

17. If $P(\bar{A}) = 0.7$, P(B) = 0.7 and P(B/A) = 0.5, Find $P(A \cap B)$ and $P(A/B)$.

18. If A = $\begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ and B= $\begin{bmatrix} 2 & -2 \\ 4 & 2 \\ 4 & 2 \end{bmatrix}$. Find the matrix X such that 2A+2X= 5B.

19. Using determinants, show that the points (11,7), (5,5) and (-1,3) are collinear

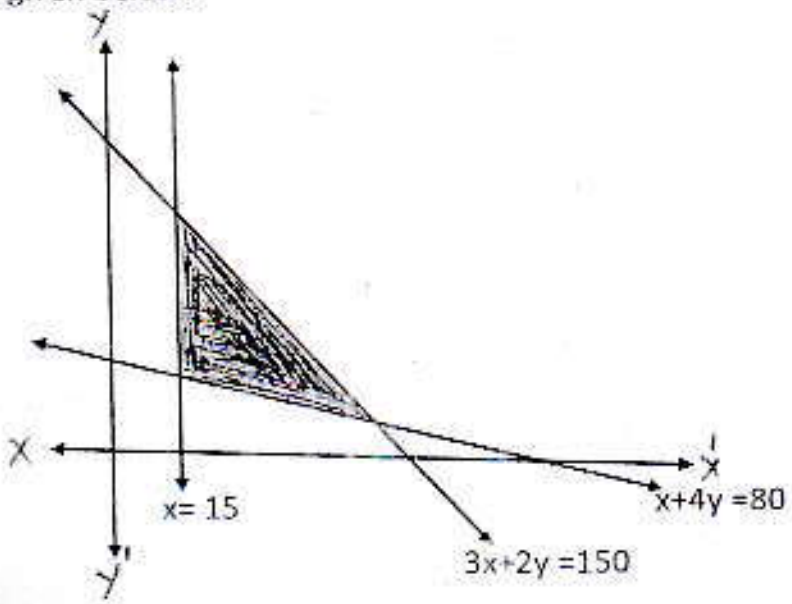
20. The probability distribution of random variable X is given below:

X	0	1	2	3
P(X)	k	$\frac{k}{2}$	$\frac{k}{4}$	$\frac{k}{8}$

Determine the value of (i) k (ii) P(X > 2)

21. If $A = \begin{bmatrix} 3 & -1 \\ 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -4 \\ 6 & 1 \end{bmatrix}$. Find transpose of A +3B.

22. Write the constraints of the linear programming problem whose graph is given below.



23. Differentiate $x^2+y^2 + 2hxy + 2gx + 2fy + c = 0$ with respect to x.

24. Express the matrix $A = \begin{bmatrix} 3 & -2 & 1 \\ 2 & 1 & 4 \\ 5 & 7 & -1 \end{bmatrix}$ as a sum of symmetric and skew-symmetric matrix.

25. If y = log (logx), show that $x\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 + \frac{dy}{dx} = 0$.

26. Show that the function f : R → R, given by f(x) = -7x+4 , x ϵ R is bijective.

27. A and B are partners sharing profits and losses in the ratio 2 : 3 respectively. They admit C as a new partner, the new profit-sharing ratio being 1:2:2 between A, B and C respectively. C pays Rs 12,000 as premium for goodwill. Find the amount of premium shared by A and B individually.

28. The bankers gain and the true discount on a bill due after a certain time are respectively Rs 50 and Rs 5,000. Find the face value of the bill.

29. Solve the following linear programming problem graphically,

Maximise $Z = 3x + 5y$

subject to $x + 2y \leq 2000$

$x + y \leq 1500$

$y \leq 600$

$x \geq 0, y \geq 0$

30. If $f(x) = \frac{\sqrt{x+1}-1}{\log(1+x)}$, $x > 0$

$= \frac{2x^2+3x}{6x}$, $x = 0$

$= \frac{\sin 3x}{\sin 4x}$, $x < 0$

Determine Whether the function f(x) defined below is continuous at x =0. State the type of discontinuity , if the function is not continuous at x=0.

31. Solve the system of linear equations, by matrix method

$x+2y+z = 7$

$x+3z = 11$

$2x-3y = 1$

32. Solve the following linear programming problem graphically,

Maximise $Z = 5x + 10y$

subject to $x - 2y \geq 0$

$x + 2y \leq 120$

$x + y \geq 60$

$x \geq 0, y \geq 0$

33. Mani draws a bill of exchange after the date on Gita for Rs 50,000 on January 6,2020, which is due after 5 months. Gita accepts the bill on January 15, 2001 and returns it back to Mani. Mani discounted the bill from a bank for Rs 49,000 on the same day. Find the rate at which the bill was discounted?

OR

Sudha accepted a bill after sight for Rs 1,800 on August 23,2000 due 6 months hence. The holder of the bill discounted it in a bank at 5% for Rs.1,782. Find out the date on which the bill was discounted.

34. In a Cricket camp ,40% of players are bowlers, 35% are batsmen and 25% are all rounders .The probability of being selected for the team is 0.6 for bowlers, 0.5 for batsmen and 0.8 for all rounders. If a randomly chosen player is selected for the team. Find the probability that he is an all rounder.

OR

The weather department predicts rain with 80% accuracy when it actually rains, and predicts rain with 10% probability when it does not rain. In a particular city,the probability that it rains on any given day is 0.3. If the forecast predicts rain ,find the probability that it actually rains that day.

35. Radhika and Gauri invested Rs. 8,00,000 and Rs. 10,00,000 respectively in a partnership business. Each partner is paid 5% of the profit as the interest of investments. Find a present worth of each partner, the profit of Rs.5,40,000 is distributed in the ratio of their capital investments, after paying the interest on investment.

OR

A, B and C engaged in a business and made investment and withdrawl of capital as follows : Jan1, A puts in Rs 15,000, on May 1, added Rs10,000 and withdrew Rs 8,000 on October 1. B put in Rs 20,000 on Jan1, withdrew Rs 5,000 on July 1 and added Rs 2,000 on Nov 1. C put in Rs 15,000 on Jan 1, withdrew Rs.5,000 on April 1, and added Rs 20,000 on Sep1. The net gain for the year was Rs.20,070. Find the Profit shared by each partner if the profit being apportioned according to the capital invested and time it was in use.

36. The total cost of a firm is $C(x) = 1000 + \frac{x^2}{5000}$, where C is the total cost and x is the output, and price under pure competition is fixed at Rs 2 per unit.Find the number of units produced that will maximise the Profit . What is the amount of this maximum Profit? What is the Price per unit , for which the Profit is maximum?

OR

The average cost function associated with producing and marketing x units of an item is given by $AC = 2x - 11 + \frac{50}{x}$. Find

(i) Cost Function and Marginal Cost Function.

(ii) Show that $\left[\frac{d}{dx}(AC)\right]x^2 = xMC - C(x)$

*** THE END ***