

Vidya Vikas Mandal's

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

Date : 12/12/2025

Margao – Goa

Marks : 80

Preliminary Examination

Subject : MATHEMATICS AND STATISTICS

1. All questions are compulsory.
 2. The question paper consists of 36 questions.
 3. Question number 1 to 8 are multiple choice type question of one mark each.
 4. Question number 9 to 16 are very short answer type question of one mark each.
 5. Question numbers 17 to 22 are short answer type - I question of two marks each.
 6. Question numbers 23 to 28 are short answer type -II question of three marks each.
 7. Question numbers 29 to 34 are Long answer type -I question of four marks each.
 8. Question numbers 35 to 36 are Long answer type -I question of five marks each.
 9. 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.
 10. Use of calculators is not permitted.
 11. Log tables will be supplied on request.
 12. Graph should be drawn on the answer paper only.
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1. Which of the following orders of a matrix, represent a square matrix?
(A) 4×1
(B) 3×2
(C) 2×2
(D) 1×4

2. If the points $A(k, -1)$, $B(2, 1)$, $C(4, 5)$ are collinear, then the value of k , using determinants is -----.

- (A) 0
- (B) 1
- (C) 2
- (D) 3

3. Let $f: \mathbb{R} - \{-3\} \rightarrow \mathbb{R} - \{1\}$ be defined by $f(x) = \frac{x}{x+3}$, then f is -----.

- (A) Injective but not surjective
- (B) Surjective but not Injective
- (C) Injective and Surjective
- (D) Neither Injective nor Surjective.

4. If $y = 8 + 2 \sin x$, then $\frac{dy}{dx}$, at $x = 0$ is -----.

- (A) 0
- (B) 1
- (C) 2
- (D) 8

5. If E and F are independent events, then $P(E' \cap F') =$ -----.

- (A) $P(E')P(F)$
- (B) $P(E)P(F')$
- (C) $P(E)P(F)$
- (D) $P(E')P(F')$

6. The current value of a sequence of equal periodic payments over a certain period of time is called-----

- (A) Amount of an Annuity
- (B) Present Value of an Annuity
- (C) Term of an annuity
- (D) Payment period of an Annuity

7. The order and degree of the differential equation $\sqrt{\left(\frac{d^3y}{dx^3}\right)^3} + y = 7$ is -----

- (A) Order = 3 Degree = 3
- (B) Order = 3 Degree = 2
- (C) Order = 3 Degree = 1
- (D) Order = 3 Degree = N.D

8. The instantaneous rate of change of total revenue at any level of output is called -----.

- (A) Total revenue function
- (B) Marginal Average Revenue function.
- (C) Average Revenue function
- (D) Marginal Revenue Function

9. If $\begin{vmatrix} 1 & 4 & 5 \\ 1 & 0 & 3 \\ 0 & 4 & x \end{vmatrix} = 0$. Find the value of x.

10. Differentiate $y = \sin^4(3x^2+5)$ w.r.t x.

11. Define Banker's Gain .

12. If the Present value on a bill legally due four months hence at 5% p.a is Rs 45,000 then , find the true discount of the bill.

13. A die is thrown . Let $A = \{2,4,6\}$ and $B = \{1,2,3\}$. Find $P(B/A)$.

14. Evaluate $\int_{-6}^6 x^5 dx$.

15. If $y = e^{e^x}$, then find $\frac{dy}{dx}$.

16. Define Bill of Exchange after sight.

17. Find $\frac{dy}{dx}$, if $y = 5x - 9 \log y$.

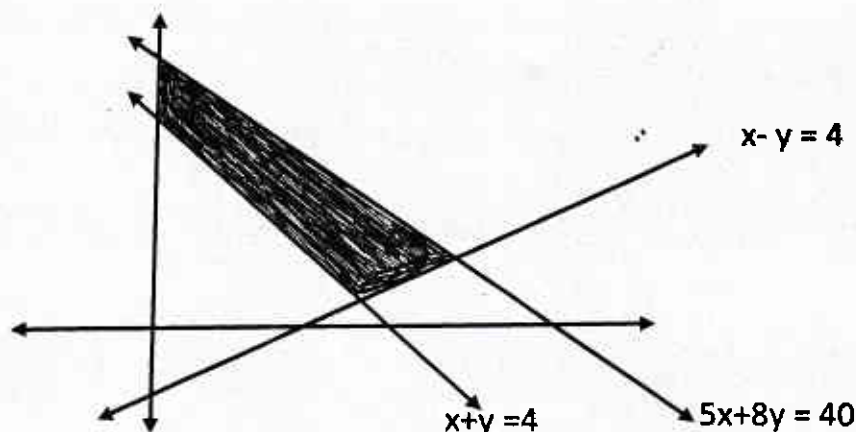
18. Find the general solution of the differential equation
 $(4y - 1)dx = (4x + 5)dy$.

19. Find $\int \frac{2x+3}{x^2-9} dx$.

20. Find y, if $\begin{bmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} + 2 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 43 \\ 44 \end{bmatrix}$.

21. X and Y are partners sharing profits in the ratio 4:1. X surrenders one-fourth of his share and Y surrenders half of his share in favour of Z, a new partner. Find the sacrificing ratio of X and Y.

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



23. Evaluate $\int_0^1 x^2 \sqrt{1-x} dx$.

24. If $A = \begin{bmatrix} 4 & -2 & 6 \\ 3 & 5 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ -3 & 4 \\ 5 & 6 \end{bmatrix}$. Verify that $(AB)^T = B^T A^T$, where T stands

for Transpose of a matrix.

25. If $R = \{(x,y) : x-y \text{ is divisible by } 7\}$ is a relation defined on Z , the set of integers. Show that R is reflexive, symmetric and transitive.

26. If $y = (2x+3)^x + \tan x$. Find $\frac{dy}{dx}$.

27. Solve the homogeneous differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{y^2}{x^2}$.

28. A Bill of exchange drawn on 4th January 2003 at 5 months is discounted on 26th March 2003. If the bankers discount at 4% per annum be Rs 4000. Find the face value of the bill.

29. Solve the following linear programming problem graphically,

$$\text{Maximise } Z = 3x + 2y$$

$$\text{subject to } x + 2y \leq 10$$

$$3x + y \leq 15$$

$$x \leq 4$$

$$x \geq 0, y \geq 0$$

30. If f is continuous at $x = 0$, where

$$f(x) = \begin{cases} \frac{e^{ax} - 1}{\sin 6x - \sin 5x}, & x < 0 \\ 3, & x = 0 \\ \frac{\tan x - bx}{x}, & x > 0 \end{cases}$$

Find values of A and B .

31. Evaluate $\int \frac{5x+6}{(x+1)(x+4)(x-2)} dx$

OR

Evaluate $\int \frac{x+3}{\sqrt{x^2+2x+2}} dx$

32. Solve the following system of linear equations by matrix method

$$x + y + z = 4$$

$$2x - y + 2z = 5$$

$$3x + 4y = 7$$

33. At an Airport passengers travel through three different Airlines A, B and C. The percentage of passengers flying through Airline A is 45%, Airline B is 35% and Airline C is 20% respectively. The probability that the luggage is delayed by Airline A is 6%, Airline B is 8% and Airline C is 10%. A passenger's luggage is found delayed. Find the probability that the passenger travelled by Airline C.

34. X and Y entered into a partnership with capitals in the ratio 4: 5. After 3 months, X withdraws $\frac{1}{4}$ th of his capital and Y withdraws $\frac{1}{5}$ th of his capital. If the profit at the end of year is Rs 3,60,000. Find the shares of both X and Y in the profit.

OR

In a firm A, B and C contributed Rs 25,00,000, Rs 35,00,000 and Rs 40,00,000 respectively. They agreed to divide the profit in proportion to the capital and to pay Rs 20,000 and Rs 30,000 per month for six months as salary to A and B for their services to the firm as Manager and General Manager respectively. What should each partner receive out of a total profit of Rs 20,00,000.

35. A monopolist has a demand function $x = 240 - 10p$ and the average cost function $AC = 10 + \frac{x}{25}$, where x represents the unit of output and p , the price per unit. Determine the most profitable output and the maximum profit.

OR

A profit making company wants to launch a new product. It observed that the fixed cost of the new product is Rs 35,000 and the variable cost per unit is Rs 500. The revenue function from the sale of x units is given by $Rs\ 5500x - 100x^2$. Maximize the Profit function and find the maximum Profit.

36. A Firm anticipates a capital expenditure of Rs 5,00,000 for a new equipment in 10 years .How much should be deposited at the end of each year in a fund at 8% per annum compounded annually to provide for the purchase (Use log table).

OR

What is the present value of an annuity due of Rs 1000 payable quarterly for 6 year, if money is worth 8% per annum compounded quarterly. (Use log table).

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