Vidya Vikas Mandal's

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

Date : 25/10/2024 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. If A = $[a_{ij}]$ be an mxn matrix, then the matrix obtained by interchanging the rows and columns of A is called - - - - .
   (A) Transpose of A
   (B) Adjoint of A
   (C) Inverse of A
   (D) None of the above

2. If $x = 9t^4$ and $y = t$ then $\frac{dy}{dx}$ = ------.

(A) $\frac{1}{36t^3}$

(B) $\frac{1}{36t^2}$

(C) $\frac{-1}{36t^3}$

(D) $\frac{1}{32t^3}$

3. A relation R on the set of real numbers defined as $R = \{(a,b): a \leq b\}$ 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. $\int \frac{1+\cos x\, dx}{\sin x + x}$ = -----.

(A) $\log|\cos x - 1| + c$
(B) $\log|\sin x + x| + c$
(C) $\log|1 + \cos x| + c$
(D) $\log|x - \sin x| + c$

5. Using determinants, the area of triangle formed by the vertices (-2,-3),(3,2) and (-1,-8) is -------.

(A) 15 sq units
(B) 16 sq units
(C) 18 sq units
(D) 20 sq units

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. Let A = { 5,6,7} and consider the relation
R = {(5,5),(6,6),(7,7),(5,6),(6,7),(5,7)}. Then R is
(A) reflexive and transitive but not symmetric
(B) reflexive but not transitive
(C) symmetric and transitive
(D) neither symmetric nor transitive

8. If the total revenue received from sale of x units of a product is given by $R(x) = 36x + 3x^2+5$, The marginal revenue when x = 5 is ----
(A) 36
(B) 46
(C) 56
(D) 66

9. Define a scalar matrix.

10. Define Bankers Discount.

11. Define a singular matrix.

12. Differentiate $y = e^{tanx}$ w.r.t x.

13. Find x, if the matrix $A = \begin{bmatrix} 0 & 2 & x \\ -2 & 0 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ is skew-symmetric.

14. Define a Breakeven point.

15. Differentiate $y = \sqrt[3]{(2x^2 - 7x - 4)^5}$ w.r.t x.

16. Evaluate $\int e^x (\cot x + \log\sin x)dx$.

17. Differentiate $x^2y^3 - \sin y = 10$ w.r.t x.

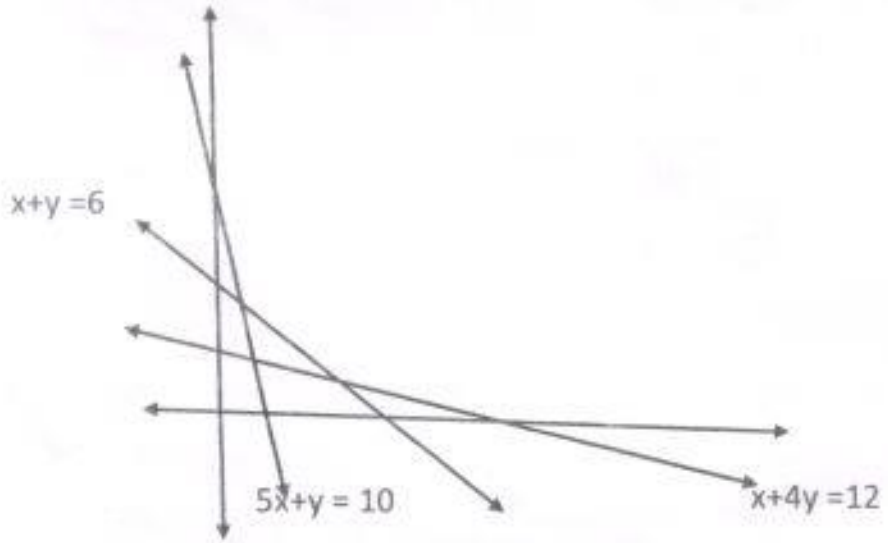
18. The bankers discount and true discount on the bill due three months hence are Rs 615 and Rs 600 respectively .Find the rate percent of the bill.

19. Find x , such that $\begin{bmatrix} x & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x \\ 5 \end{bmatrix} = 0$.

20. Find the true discount on a bill of rupees 22,800 due 4 months at 4% per annum .

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. Find $\int_2^7 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{9-x}}\,dx$.

24. Express the matrix A = $\begin{bmatrix} 5 & -1 & 3 \\ 2 & 1 & 4 \\ 3 & 6 & 10 \end{bmatrix}$ as a sum of symmetric and skew-symmetric matrix.

25. If y = sin(logx), show that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = -y$.

26. Show that the function f : R → R, given by f(x) = $\frac{4x-1}{5}$, x ϵ R is bijective.

27. If the total cost function is given by C = 4 +5x +6x^2, where x is the quantity of output, show that $\frac{d}{dx}(AC) = \frac{MC-AC}{x}$.

28. Differentiate y = $\frac{sin^4 x}{cos^2 4x\, sec^3 3x}$ with respect to x.

29. Solve the following linear programming problem graphically,

Maximise Z = 2x+ 3y

subject to $x + y \geq 4$

$x - y \leq 4$

$5x + 8y \leq 40$

$x \geq 0, y \geq 0$

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

$$f(x) = \frac{(e^{\sin x}-1)^2)}{x\tan x} + 2a \quad , x < 0$$

$$= 5 \quad , x = 0$$

$$= \frac{\log(1-4x)}{x} - 4b \quad , x > 0$$

Find values of a and b.

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

$$2x+2y+z = 13$$
$$4y+z = 17$$
$$-3x+2y = 3$$

OR

Solve the system of linear equations by matrix method

$$3x+2y+4z = 19$$
$$2x-y+z = 3$$
$$6x+7y-z = 17$$

32. Solve the following linear programming problem graphically,

Maximise $Z = 3x+y$

subject to $4x+y \geq 8$

$8x+7y \leq 56$

$x \leq 5$

$x \geq 0, y \geq 0$

33. A bill is drawn on April 14 2002 for eight months after date and was discounted on July 24 2002 at 5% per annum .If the bankers gain on the basis of simple interest is rupees 20 for what sum was the bill drawn?.

OR

A bill of Rs 4000 drawn on 10 February 2000 for ten months was discounted for Rs 3910 at $3\frac{3}{4}$ % p.a. Find the date on which the bill was discounted.

34.If $A = \begin{bmatrix} 1 & 3 & 3 \\ 3 & 1 & 3 \\ 3 & 3 & 1 \end{bmatrix}$.Show that $A^2 - 5A - 14I = 0$. Hence find A^{-1}.

35. Evaluate $\int \frac{3x+1\,dx}{\sqrt{3x^2-4x-5}}$

OR

Evaluate $\int \frac{sec^2 x dx}{(2+tanx)(3+tanx)}$

36. A monopolist firm has the following demand and average cost functions. x = 240-10p and AC= 10 + $\frac{x}{25}$. Determine the profit maximizing output.

OR

A manufacturer finds that his product can be assembled at a total cost C = Rs (200+30x), where x is the number of units manufactured. To assume that the price at which he can sell each unit is given by p = Rs(150 - $\frac{x}{3}$).what level of production will maximize the total profit? What is the corresponding selling price per unit?

*** THE END ***