Vidya Vikas Mandal's

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

Date : 20/12/2024 Margao – Goa Marks : 80

Preliminary Examination

Subject : MATHEMATICS AND STATISTICS

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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. If $\begin{bmatrix}3 & 1 & 5\end{bmatrix}\begin{bmatrix}1 & 3 & 0\\ 2 & -1 & 5\\ 3 & 4 & 6\end{bmatrix}\begin{bmatrix}5\\ 3\\ 2\end{bmatrix} = A$, then the order of matrix A= -----

(A) 1x1

(B) 2x1

(C) 3x1

(D) 3x3

2. If $\begin{vmatrix} 3x & 7 \\ -2 & 4 \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 6 \end{vmatrix}$ , then value of x = -----.

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

3. If $y = \frac{1}{x} + 4\log x$, then $\frac{dy}{dx}$ at $x = 1$ is-----.

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

4. Using determinants, the value of k , for which the vertices (1,2) ,(3,0),(2,k) are collinear is -----.

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

5. Two events E and F are said to be independent ,if P(F|E) = -------.

(A) P(E)
(B) P(F)
(C) $P(E \cup F)$
(D) $P(E \cap F)$

6. The legal due date of a bill drawn on April 4,2011 payable 6 months after date is ----

(A) October 4, 2011
(B) October 7, 2011
(C) November 4, 2011
(D) November 7,2011

7.The order of the differential equation

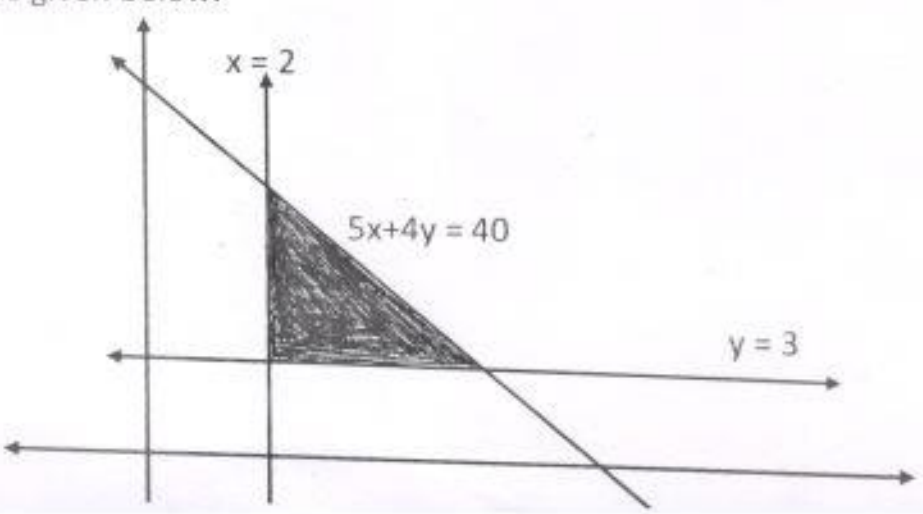
$\frac{d^3y}{dx^3} + x\left(\frac{dy}{dx}\right)^{\frac{3}{2}} + x^2y = 0$ is

(A) 6
(B) 3
(C) 2
(D) 1

8. At the break -even point -----,
   (A) Profit = Revenue function
   (B) Revenue Function = Cost function.
   (C) Average cost = Marginal cost
   (D) Profit = Cost Function
9. Define Annuity Due.
10. Define Bill of Exchange.
11. In a certain college, 25% of the students failed in Physics,15% of students failed in chemistry and 10% of the students failed both in Physics and Chemistry. A student is selected at random, if he failed in chemistry, what is the probability that he failed in Physics ?
12. If the average cost function of a firm is given by AC = $300-10x+\frac{1}{3}x^2$. Find the marginal cost.
13. Differentiate $y = 5^{x^3+4x-5}$ w.r.t x.
14. Define Present worth of a firm.
15. If $x^2+y^2= e^x$. Find $\frac{dy}{dx}$.
16. If $P(A') = \frac{5}{8}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$. Find P(B/A).
17. Show that f: R- $\{3\} \to R$ , defined by $f(x) = \frac{2x+3}{x-3}$ is injective.
18. Solve the differential equation $y^2 + \frac{dy}{dx} = x^2\frac{dy}{dx}$.
19. If $x= \sec^2\theta$ and $y = \tan\theta$, then find $\frac{dy}{dx}$.
20. Find the values of x and y from the following equations

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

21. Show that the relation R in $\mathbb{R}$, where $\mathbb{R}$ is the set of real numbers defined as $R = \{(a, b): a \leq b\}$ is reflexive but not symmetric.
22. Write the constraints of the linear programming problem whose graph is given below.



23. Evaluate $\int_3^5 \frac{\sqrt{1+x}}{\sqrt{9-x}+\sqrt{1+x}}\,dx$.

24. Express the matrix $A = \begin{bmatrix} 3 & 6 & 1 \\ 2 & 7 & -1 \\ 4 & 2 & 5 \end{bmatrix}$ as a sum of symmetric and skew-symmetric matrix.

25. If $y = (\sqrt{x})^{\sin x} + 4x^3$. Find $\frac{dy}{dx}$.

26. Find $\int \frac{2x+3}{\sqrt{4x-5}}\,dx$.

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

28. For 3 persons A, B and C, the chances of being selected as manager of a firm are $\frac{4}{7}, \frac{1}{7}$ and $\frac{2}{7}$ respectively. The respective probabilities for them to introduce a radical change in marketing strategy are 0.3,0.8 and 0.5. If the change does take place, find the probability that it is due to appointment of C.

29. Solve the following linear programming problem graphically,

Maximise $Z = 3x + 5y$

subject to $3x + 4y \geq 12$

$4x + 7y \leq 28$

$y \geq 1$

$x \geq 0, y \geq 0$

30. Discuss the continuity of the function at $x = 0$, where

$$f(x) = \frac{x^2 - 4\sin x}{x}, \quad x < 0$$

$$= \frac{x-24}{x+3} + 4, \quad x = 0$$

$$= \frac{\log(1+8x)}{-2x}, \quad x > 0$$

31. Evaluate $\int \frac{3x-2}{(x+1)^2(x+3)}\,dx$

OR

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

32. Solve the system of linear equations by matrix method

$$2x - 3y + 5z = 11$$
$$3x + 2y - 4z = -5$$
$$x + y - 2z = -3$$

33. A broker discounts a bill for a certain amount which has 3 months to run before it matures legally at $5\frac{1}{2}\%$ p.a. If the discounted value of the bill is Rs 31,560. Find the (i) face value of the bill (ii) Bankers Discount.

OR

The difference between bankers discount and true discount on a bill legally due three months hence at 5% per annum is Rs 200. Find the face value, bankers discount and true discount?

34. If the Profit function is given as $P(x) = 112x - 500 - \frac{28}{15}x^2$. Find the level of output for which the profit is maximum and the maximum profit.

35. A,B and C form a partnership and contributed Rs 3,00,000, Rs 4,00,000 and Rs 5,00,000 respectively towards capital. They agree to divide the annual profit in proportion to the capital employed and to the time it is in use. After 6 months C withdrew Rs. 50000 and B added Rs.50,000. At the end of the year the profit was rupees 12,24,000. How will they share this profit?

OR

A, B and C started a partnership and invested Rs 1,00,000 ,Rs 80,000 and Rs 1,20,000 respectively . C took a loan of Rs. 70,000 and paid 9.5% interest to the firm. The firm earned a profit of Rs 1,35,400 in addition to the interest from the loan. Find each partners present worth if the total profit is distributed in ratio of the capital investments.

36. A person bought a two - wheeler paying Rs 70,000 in cash and the balance in 10 instalments of Rs 8,000 each at the end of each year. If the interest be reckoned at 16%, how much should he have paid if he had purchased it cash down? ( Use log table).

OR

Determine the quarterly payments for a 10 years term for an annuity due having future value 4,00,000 if money is worth 8%p.a compounded quarterly. ( Use log table)

*** THE END **