



Seat No. :

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Time : 2 Hours

MATHEMATICS (Vocational)

Subject Code

V	3	1	1
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Total No. of Questions : 5

(Printed Pages : 2)

Maximum Marks : 50

- INSTRUCTIONS** : 1) Answer **each** question on a **fresh** page.
2) Write the numbers of the question and sub-question **clearly**.
3) **All** questions are **compulsory**.
4) Figures to the **right** indicate **full** marks.
5) **Use** of logarithm table is **allowed**.
6) Graph paper will be supplied on request.

1. A) Find the matrix A if $A = [a_{ij}]_{3 \times 2}$ and

$$a_{ij} = i - 2j \quad \text{when } i = j$$

$$= i + j \quad \text{when } i < j$$

$$= 2i + j \quad \text{when } i > j$$

[1]

B) Construct a backward difference table for the following data :

[2]

X	1	2	3	4	5	6
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Y	12	15	20	27	39	69
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 Hence identify $\nabla_{y^4}^3$ and $\nabla_{y^5}^2$.C) Evaluate $\lim_{x \rightarrow 3} \frac{x^3 - 5x - 12}{\sqrt{2x^2 - 9} - 3}$, if it exists.

[3]

D) Solve the following linear programming problem using graphical method :

Maximize $Z = 2x + 5y$

subject to $2x + 4y \leq 8$,

$3x + y \leq 6$,

and $x \geq 0, y \geq 0$.

[4]



2. A) Differentiate $\cot(xy)$ with respect to x . [1]
- B) If $B = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, find s , so that $B^2 + 2I = s.B$. [2]
- C) Evaluate $\int x^2 \sin x \, dx$. [3]
- D) If $x^m y^n = (x + y)^{m+n}$, show that $\frac{dy}{dx} = \frac{x}{y}$. [4]
3. A) Evaluate $\int \frac{\cos x}{5 + \sin x} \, dx$. [1]
- B) A bag contains 7 white, 5 black and 4 red balls. If two balls are drawn at random from the bag, find the probability that one is black and the other is red. [2]
- C) Evaluate $\int_0^4 x(4x^2 + 9x + 6) \, dx$. [3]
- D) Find the regression line of Y on X for the following data :
- | | | | | | | |
|----------|---|---|----|----|----|----|
| X | 3 | 2 | -2 | -1 | -2 | 0 |
| Y | 0 | 3 | -2 | -2 | 2 | -1 |
- [4]
4. A) Find x , if $C = \begin{bmatrix} 4 & x \\ 3 & -6 \end{bmatrix}$ is a singular matrix. [1]
- B) Evaluate $\int \left[\frac{1}{\sqrt{2x+3} - \sqrt{2x}} \right] \, dx$. [2]
- C) Evaluate $\int_0^6 (2x + 5) \, dx$, using Trapezoidal rule with 6 strips. [3]
- D) Solve the following equations using matrix method. [4]
 $x + 3z = 5$, $2x + 2y + z = 5$, $-4y - 4z = -4$.
5. A) Evaluate $\int [(3x + 7)^4 - (7 - 3x)^{-4}] \, dx$. [1]
- B) Find $\frac{dy}{dx}$, if $ye^x + 2^x = \cos y$. [2]
- C) Form a differential equation given $y = Ae^{-5x} + Be^{5x}$. [3]
- D) Using Lagrange's Interpolation formula, find $f(2)$ given that $f(0) = 3$, $f(1) = 4$, $f(3) = 12$. [4]