Time : 2 Hours

Mathematics (Vocational)

Subject Code

V	3	1	1

Total No. of Questions : 5 **(Printed Pages : 4)** **Maximum Marks : 50**

INSTRUCTIONS : (*i*) Answer each question on a fresh page.

(*ii*) Write the number of questions and sub-questions clearly.

(*iii*) *All* questions are compulsory.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic table is allowed.

(*vi*) Graph paper will be supplied on request.

1. (A) If 1

$$A = \begin{bmatrix} 1 & a \\ 3 & 7 \end{bmatrix}$$

then find $A + A^T$ where A^T is the transpose of A.

(B) Construct a backward difference table for the following data : 2

x	12	22	32	42	52	62
y	–3	–5	–2	0	5	7

Find $\nabla^3 y_{32}$ and $\nabla^5 y_{62}$.

(C) If f is continuous on [–2, 7] where 3

$$f(x) = \begin{cases} 2x^2 + ax + 2b & -2 \le x < 0 \\ 7x + 3 & 0 \le x \le 3 \\ 4ax + 3b & 3 < x \le 7 \end{cases}$$

Find the value of a and b.

(D) Solve the following linear programming problem using Graphical method : 4

Minimize : $Z = x + 4y$

Subject to : $x + 3y \geq 3$

$2x + y \geq 2$

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

2. (A) If $y = x^4 + 4^x + 4^4$, find $\frac{dy}{dx}$. 1

(B) If 2

$$A = \begin{bmatrix} 2 & 5 \\ 1 & 7 \\ 5 & 6 \end{bmatrix}, B = \begin{bmatrix} 3 & 2 \\ -5 & 1 \\ 1 & 4 \end{bmatrix}, C = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix},$$

find the values of x, y and z if $X = (4A - 7B)C$.

(C) Evaluate : 3

$$\int x^3 \log x \, dx.$$

(D) If 4

$$x = a(\sin\theta - \theta\cos\theta),\ y = a(\cos\theta + \theta\sin\theta),$$

find $\frac{dy}{dx}$.

3. (A) Evaluate : 1

$$\int \left[\sin(3x+5) + e^{(3x+5)}\right] dx.$$

(B) A ten rupees gems packet contains 6 red gems, 3 blue gems, 5 yellow gems, 3 purple gems and 3 pink gems. If two gems are drawn at random from the packet, find the probability that one is red and the other is a yellow gem. 2

(C) Evaluate : 3

$$\int_0^1 \left(\frac{1}{\sqrt{x+1} - \sqrt{x}}\right) dx.$$

(D) Find the coefficient of correlation for the following data : 4

x	1	2	3	4	5
y	4	5	6	7	8

4. (A) If 1

$$A = \begin{bmatrix} 4 & b \\ 2 & 3 \end{bmatrix} \text{ and } |A| = 4$$

find the value of b.

(B) Evaluate : 2

$$\int \left[\frac{1}{x \log x} + \frac{1}{x}\right] dx.$$

(C) Evaluate : 3

$$\int_0^8 (x + 3)\, dx$$

using trapezoidal rule for 8 strips.

(D) Solve the following using matrix method : 4

$$2x + y - z + 2 = 0,\ 3x - z = 5,\ 4y + 3z = 9.$$

5. (A) Evaluate : 1

$$\int \left[\sqrt{x} - 2 \cot x \,.\, \operatorname{cosec} x\right] dx.$$

(B) If $y = x^3 \log(\sin x)$, find $\dfrac{dy}{dx}$. 2

(C) Form the differential equation : 3

$$y = Ae^{2x} + Be^{-2x} + x^2,$$

where A and B are arbitrary constants.

(D) Given that $f(0) = 4$, $f(2) = 6$, $f(4) = 8$. Using Lagrange's inverse interpolation formula find the value of x when $f(x) = 7$. 4