2025 II 21 0930 Seat No. | | | | | |

Time : 2 Hours

MATHEMATICS
(Vocational)

Subject Code

V	4	3	1	1

Total No. of Questions : 22 (Printed Pages : 4) Maximum Marks : 50

INSTRUCTIONS : (*i*) *All* questions are compulsory.

(*ii*) The question paper consists of **22** questions divided into **4** Sections A, B, C and D.

(*iii*) **Section–A** contains **6** questions of 1 mark each.

Section–B contains **8** questions of 2 marks each.

Section–C contains **4** questions of 3 marks each.

Section–D contains **4** questions of 4 marks each.

(*iv*) Write the number of each question clearly on the answer book.

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

Section – A

1. If $A = \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$, find $A^T + B^T$.

2. Write matrix A such that :

$A = [a_{ij}]_{2\times 2}$ if $a_{ij} = i + j$ when $i \neq j$

$= i - j$ when $i = j$

3. If $y = x^6 + 6^x + 6^6$, then find $\frac{dy}{dx}$.

4. Evaluate :

$$\int \cos(4x + 10)\, dx.$$

5. Evaluate :

$$\int (5x^4 + 4x^3 + 15)\,dx$$

6. Evaluate :

$$\int_4^8 3x^2 dx$$

Section – B

7. Construct forward difference table for the following data :

X	Y
1	2
2	5
3	7
4	10
5	13

Also find value of $\Delta^2 y_3$ and $\Delta^4 y_1$.

8. If $A = \begin{bmatrix} 2 & 5 \\ 1 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 2 \\ -5 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $X = \begin{bmatrix} x \\ y \end{bmatrix}$, then find the value of x and y if $X = (3A - 2B)\,C$.

9. A bag contains 7 red balls, 5 white balls and 3 black balls. Two balls are drawn at random from the bag. Find the probability that one is red and other is white ball.

10. A card is drawn from a pack of 52 cards. Find the probability that the card drawn is a spade card.

11. Find $\frac{dy}{dx}$, if $y = e^{4x} \sin 6x$.

12. Find $\frac{dy}{dx}$, if $x^2 + y^2 + 2gx + 2fy + c = 0$.

13. Evaluate :

$$\int 5(3x+10)^4 \, dx.$$

14. Evaluate $\int_4^8 (2x+4)dx$ using Trapezoidal rule with $n = 4$.

Section - C

15. If f is continuous function on [0, 8] where

$$f(x) = \begin{cases} x^2 + ax + 3b & \text{for } 0 \le x < 2 \\ 7x - 2 & \text{for } 2 \le x \le 4 \\ 3ax + 7b & \text{for } 4 < x \le 8 \end{cases}$$

Find the values of 'a' and 'b'.

16. If $x = at^2$ and $y = 2at$, find $\frac{dy}{dx}$.

17. Evaluate :

$$\int x^2 \log x \; dx$$

18. Evaluate $\int_0^6 (3x+8)dx$ using Simpson's Rule with 6 strips.

Section – D

19. Given the following data, use Lagrange's interpolation formula to obtain value of Y when X = 6 :

X	Y
2	4
5	7
8	11

20. Obtain regression line of Y on X for the following data :

X	Y
6	5
7	4
8	3
9	2
10	1

Also find Y when X = 6.5.

21. Solve the L.P.P. by graphical method :

Maximise $Z = 6X + 7Y$

Such that

$2X + 3Y \leq 12$

$2X + Y \leq 8$

And $X \geq 0, Y \geq 0$.

22. Find inverse of the following matrix :

$$\begin{bmatrix} 2 & 3 & 3 \\ 1 & -2 & 1 \\ 3 & -1 & -2 \end{bmatrix}$$