



Roll no.....

End Semester Examination, December 2024
Open Elective – III Semester
MATHEMATICS FOR EVERYONE (OEC048)

Time: 2.5 hrs.

Max Marks: 50

Note: *All Questions are compulsory. Marks are indicated against each question.*

PART-A

Q.1 Attempt any five questions:

- (a) Define symmetric and skew-symmetric matrices with example. [CO-1] [L-1] 2
- (b) If $A = \begin{bmatrix} 3 & 5 & 7 \\ 9 & 8 & 2 \\ 1 & 0 & -1 \end{bmatrix}$, find the value of $3a_{11} + 5a_{21} + a_{33}$. [CO-1] [L-1] 2
- (c) Describe the principle of counting in permutations. Give an example. [CO-1] [L-2] 2
- (d) Explain concept of factorial with example. [CO-1] [L-2] 2
- (e) Find the characteristic equation for the matrix $\begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix}$. [CO-1] [L-1] 2
- (f) Define measures of central tendency. [CO-1] [L-1] 2
- (g) Find the range of the distribution 6, 8, 2, 10, 15, 5, 1, 13. [CO-1] [L-1] 2

2x5

PART-B

Q.2 State and verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. Also find A^{-1} . [CO-2] [L-4] 10

OR

Explain linear dependence and independence of vectors. Examine the following vectors for linear dependence. If dependent, find the relation between them

$$v_1 = (1 \ -1 \ 1), v_2 = (2 \ 1 \ 1), v_3 = (3 \ 0 \ 2). \quad [\text{CO-2}] [\text{L-3}] 10$$

Q.3 Solve the linear programming problem using the graphical method:

$$\text{Minimize } z = 2x_1 + 3x_2$$

$$\text{Subject to } x_1 + x_2 \leq 4$$

$$6x_1 + 2x_2 \geq 8$$

$$x_1 + 5x_2 \geq 4$$

$$x_1 \leq 3$$

$$x_2 \leq 3$$

$$x_1, x_2 \geq 0.$$

[CO-3] [L-3] **10**

OR

Solve the linear programming problem using the simplex method:

$$\text{Maximum } z = 7x_1 + 6x_2$$

$$\text{Subject to } 2x_1 + 4x_2 \leq 16$$

$$3x_1 + 2x_2 \leq 12$$

$$x_1, x_2 \geq 0.$$

[CO-3] [L-3] **10**

- Q.4 Differentiate between permutations and combinations. How many distinct ways can 5 people be seated in 3 chairs? [CO-4] [L-2] **10**

OR

Bag I contains 3 red and 4 black balls while another bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag II. [CO- 2] [L-3] **10**

- Q.5 Calculate the standard deviation and variance for the following data set: 12, 15, 20, 22, 24. Explain each step briefly. [CO-4] [L-3] **10**

OR

Calculate the mode for the following distribution:

[CO- 4] [L-3] **10**

Classes	10-20	20-30	30-40	40-50	50-60	60-70
Frequencies	8	12	25	45	11	19