25UFYG150

Reg. No .... Name..

BA BSC BCOM DEGREE END SEMESTER EXAMINATION - NOVEMBER 2025
UPG (HONS.) SEMESTER - 1 : DISCIPLINE SPECIFIC COURSE (MATHEMATICS)
COURSE : 24UMATDSC111: FOUNDATION OF MATHEMATICS
(For Regular 2025 admission & Improvement / Supplementary 2024 admission)

Duration – 2 hours | Max Marks – 70

Scientific calculators are allowed

PART-A

(Each question carries 2 marks. A maximum of 10 marks can be scored from this part.)

1 Define an upper triangular matrix. Give an example. U, CO1

2 Simplify: $2\begin{bmatrix}3 & -2 & 0\\1 & -1 & 1\\0 & 2 & 4\end{bmatrix}-\begin{bmatrix}1 & 0 & 0\\0 & 1 & 2\\3 & 1 & 2\end{bmatrix}$. U, CO1

3 Find the product $\begin{bmatrix}0 & -1 & -1 & 3\\5 & -5 & -2 & 2\\1 & 0 & 4 & 5\end{bmatrix}\begin{bmatrix}0 & -3\\-2 & -1\\3 & -3\end{bmatrix}$. U, CO1

4 Evaluate the determinant of the matrix $A=\begin{bmatrix}3 & -2 & 1\\3 & -1 & -2\\3 & -2 & -3\end{bmatrix}$ using Sarrus method. U, CO2

5 Explain the method of Gauss elimination and back substitution. C, CO3

6 Check whether the system of equations $10x+7y+8z+7w=32$; $7x+5y+6z+5w=23$; $8x+6y+10z+9w=33$; $7x+5y+9z+10w=31$ is solvable by iteration method. C, CO3

7 a) Find the bitwise AND and bitwise XOR of the bit strings 0110110110 and 1100011101. An, CO4

b) If $Q(x,y)$ denote the statement $'x=y+3'$. Find the truth values of the propositions $Q(1,2)$ and $Q(3,0)$.

8 a) Translate the sentence into logical expression: ”You will get an A in the class if and only if you either do every exercise in textbook or you get an A on the final ”. An, CO4

b) Negate the proposition : Every even number is divisible by 2.

PART-B

(Each question carries 5 marks. A maximum of 30 marks can be scored from this part.)

9 Reduce the matrix to row echelon form $A=\begin{bmatrix}1 & 2 & -1\\2 & 4 & 3\\3 & 6 & 2\end{bmatrix}$. U, CO1

10 Find the rank of the matrix by transforming into its normal form $A=\begin{bmatrix}1 & 2 & 3\\2 & 4 & 6\\1 & 1 & 1\end{bmatrix}$. U, CO1

11 a) Check whether the vectors $(1,2,3),(0,1,4)$ and $(2,1,0)$ are linearly independent or not. U, CO2

b) Find the algebraic multiplicities of each Eigen values of the matrix $A=\begin{bmatrix}2 & 0 & 0\\1 & 1 & 0\\-2 & -1 & 1\end{bmatrix}$.

12 Check whether the given matrix has as inverse. Find the inverse, if it exists; by U, CO2

$$A = \begin{bmatrix} 0 & 0 & -1 \\ 2 & 1 & 2 \\ 5 & 3 & 0 \end{bmatrix}.$$

13	Solve the following system by using Gauss Elimination method: $x + y + z = 6, 2x - y + z = 3, -x + 3y + 2z = 11.$	C, CO3
14	Solve the following system using Gauss Jordan method: $3x + y + z = 9, x - y + 2z = 11, 2x + 3y - z = -3.$	C, CO3
15	Show that $p \to (q \wedge r) \equiv (p \to q) \wedge (p \to r)$.	An, CO4
16	Show that $(p \to (q \to r)) \leftrightarrow ((p \wedge q) \to r)$ is a tautology.	An, CO4

PART-C

(Each question carries 15 marks. A maximum of 30 marks can be scored from this part.)

17 a) Define a symmetric matrix. — U, CO1

b) Find the transpose of the following matrices:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & 6 & 9 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 0 & 2 \\ 3 & 5 & 6 \\ 2 & 7 & 9 \end{bmatrix}.$$

c) Check whether the matrices A and B are symmetric?

d) Prove that if A and B are symmetric matrices of same order, then $A + B$ is also symmetric.

18 Let $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 3 \end{bmatrix}$ — U, CO2

(i) Write down the characteristic equation of the matrix.

(ii) Find the Eigen values.

(iii) Find the Eigen vectors corresponding to each Eigen value.

19 Explain Gauss –Seidel iteration method to solve a system of linear equations and apply the method for finding the solution of : — C, CO3

$2x - y + z = 3, x + 3y + z = 10, x - y + 4z = 12.$

20 Construct a truth table for each of these compound propositions. — An, CO4

a) $(p \vee q) \to (p \oplus q)$

b) $(p \oplus q) \to (p \wedge q)$

c) $(p \vee q) \oplus (p \wedge q)$

d) $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow q)$

e) $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow \neg r)$