



DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH SEMSTER-I (CE, IT, EC)
SUBJECT: (BS101) Mathematics-I

Examination : First Internal
 Date : 07/11/2022
 Time : 1 Hr 15min.

Seat No. : CE032
 Day : Monday
 Max. Marks : 36

INSTRUCTIONS:

1. Figures to the right indicate maximum marks for that question
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary

Q.1 Do as directed. [12]

(a) Investigate the values of λ and μ so that the equations [4]
 CO4 A $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$, have (i) No solution (ii) a unique solution (iii) an infinite number of solution.

CO6 A (b) Check whether the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ -3 & 5 & 2 \end{bmatrix}$ is diagonalizable or not. [4]

CO4 A (c) Find the rank of $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ [4]

Q.2 Attempt **Any TWO** from the following questions [12]

CO6 A (a) Diagonalize matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ and hence calculate A^4 . [6]

CO6 A (b) Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 0 & 2 & 4 \\ 0 & 0 & 1 \end{bmatrix}$ Also find eigenvalues of A^{-1} , A^{100} and $\text{adj}(A)$. [6]

(c) (1) Check whether the vectors $(1, 2, 1)$, $(-3, 1, 1)$, $(-1, 5, 3)$, $(0, 7, 4)$ are Linearly Dependent or not. if so find the relation between them. [6]

CO4 (2) Prove that matrix $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ is Orthogonal and hence find A^{-1} . [6]

Q.3 [12]

CO4 A (a) For what values of k the equations $x + y + z = 1$, $2x + y + 4z = k$, $4x + y + 10z = k^2$ have a solution and solve them completely in each cases. [06]

CO6 A (b) Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [06]

OR

CO4 A (a) Find the value of λ for which the equations [06]
 $(\lambda - 1)x + (3\lambda + 1)y + 2\lambda z = 0$, $(\lambda - 1)x + (4\lambda - 2)y + (\lambda + 3)z = 0$, $2x + (3\lambda + 1)y + (3\lambda - 3)z = 0$ have a nontrivial solution and solve them completely in each cases.

CO6 A (b) (1) Determine the rank of matrix $\begin{bmatrix} 1 & 4 & 5 \\ 2 & 6 & 8 \\ 3 & 7 & 22 \end{bmatrix}$ [06]

(2) Using Gauss Jordan method, find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$