HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the course: B.Tech *Semester: I*

Name of the paper: Engg. Mathematics for Artificial Intelligence-I *Paper Code: TMA - 102*

Time: 1&1/2 hours Maximum Marks: 50

Note:

(i) All questions are compulsory.

(ii) Answer any one sub questions among a and b in each main question.

(iii) Total marks in each main question are ten.

Q.1 (10×1=10 Marks) CO: 1

(a) Using elementary transformations find the inverse of $A=\begin{bmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & 1 & 1\end{bmatrix}$.

OR

(b) Examine the following vectors for linear dependence and find the relation if it exists.

$X_1=(1, 2, 4),\ X_2=(2,-1, 3),\ X_3=(0, 1, 2),\ X_4=(-3, 7, 2)$

Q.2 (10×1=10 Marks) CO: 1

(a) Find the eigen values and eigen vectors of the following matrix.

$$A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}.$$

OR

(b) Reduce the matrix A into normal form and hence find the rank of the matrix

$$A=\begin{bmatrix}1 & 2 & 3\\ 1 & 4 & 2\\ 2 & 6 & 5\end{bmatrix}$$

Q.3 10×1=10 Marks) CO: 2

(a) Verify Cayley - Hamilton theorem for the matrix,

$$A=\begin{bmatrix}4 & 3 & 1\\ 2 & 1 & -2\\ 1 & 2 & 1\end{bmatrix}$$

(b) Verify Rolle's Theorem for the function $f(x)=x^2+x-6$ in $[-3,2]$.

Term Evaluation (Odd) Semester Examination September 2025

Q.4 $10\times1=10$ Marks) CO: 2

(a) Evaluate $\lim_{x\to0}\left(\frac{1}{x^2}-\frac{1}{\sin^2 x}\right)$.

OR

(b) If $y=\tan^{-1}x$,
prove that $\left(1+x^2\right)y_{n+1}+2nxy_n+n\left(n-1\right)y_{n-1}=0$.

Q.5 $10\times1=10$ Marks) CO: 2

(a) Test the function for continuity

. $f(x,y)=\begin{cases}\frac{x^3-y^3}{x^2+y^2} & when\, x\neq0,\ y\neq0\\ 0 & when\, x=0, y=0\end{cases}$

OR

(b) Expand $\sin^{-1}x$ in powers of x by Maclaurin's series.