JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Supplementary Examination- 2026

B.Tech-I Semester (CSE/IT/ECE/CE/M&C)

COURSE CODE(CREDITS): 25B11MA113 (4)

COURSE NAME: MATHEMATICS-I

MAX. MARKS: 75

COURSE INSTRUCTORS:PKP*, NKT,RKB,MDS

MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

Q.No.	Question	CO	Marks
Q1	(a) Show that the function $$f(x,y) = \begin{cases} \dfrac{xy}{x^2+5y^2}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$$ is not continuous at (0,0). (b) Investigate $\lim_{(x,y)\to(0,0)} \dfrac{x^3y}{x^6+y^2}$.	CO-1	3+3
Q2	Expand $f(x,y) = 4x^2 + xy + 6y^2 + x - 20y + 21$ in Taylor's series of maximum order about the point (-1, 2).	CO-1	6
Q3	(a) Find all the extreme points of the function $f(x,y) = -2x^3 + 6x^2 + 3y^2 + 6xy$ and classify them. (b) Using Lagrange's multiplier method find the minimum value of $x^2 + y^2 + z^2$ subject to the conditions $ax + by + cz = 1, \ \alpha x + \beta y + \gamma z = 1$.	CO-1	3.5+3.5
Q4	Evaluate the integral $\int_0^\infty \int_0^x xe^{(-x^2/y)}dx\,dy$ by changing the order of integration.	CO-2	6.5
Q5	Show that $\int_0^{\pi/2} \sin^2\theta \cos^4\theta \, d\theta = \dfrac{5\pi}{32}$	CO-2	6.5
Q6	If $\vec{V} = \dfrac{x\hat{i}+y\hat{j}+z\hat{k}}{\sqrt{x^2+y^2+z^2}}$, find the value of div $\vec{V}$	CO-3	6.5
Q7	Solve $(D^2 - 4D + 4)y = x^3e^{2x}$	CO-4	6.5
Q8	Evaluate $L[t^2e^t \sin 4t]$	CO-4	6.5
Q9	Evaluate $L^{-1}\left[\dfrac{s}{s^2+4s+13}\right]$	CO-4	6.5
Q10	Convert the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 5 & 4 \\ 3 & 8 & 5 \end{bmatrix}$ into row echelon form, and hence find the rank of A.	CO-5	4

Q11	Consider a simple linear model (say, $y = ax_1 + bx_2 + c$) trained on three data points, giving three linear equations: $$a + b + c = 6, \qquad 2a + b + c = 8, \qquad a + 2b + c = 9$$ Using the Gauss Elimination Method find the values of a, b, c.	CO-5	6.5
Q12	Find the eigenvalues of the matrix $$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & 4 \\ 0 & 0 & 5 \end{bmatrix}$$	CO-5	6.5