

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

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

COURSE CODE (CREDITS): 25B11MA113 (4)

MAX. MARKS: 25

COURSE NAME: Mathematics-I

COURSE INSTRUCTORS: PKP*,MDS,NKT,RKB

MAX. TIME: 1 Hour 30 Min

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	Evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{2y^4x}{y^8 + 6x^2}$	CO1	3
Q2	In a database query optimizer, suppose that the cost function of executing a query is modeled implicitly by the relation $xz + y \log x - x^2 - 4 = 0;$ where x represents the number of indexing operations, y represents query depth (number of joins), and z represents the data block size. Find the sensitivity/rate of change of the indexing operations x with respect to changes in the data block size z at the point $(1, -1, -3)$.	CO1	3
Q3	Examine the function $f(x, y) = x^3 + y^3 - 3axy$ for maximum and minimum values.	CO2	3
Q4	The temperature T at any point (x, y, z) in space is $T = 400xyz^2$. Find the highest temperature at the surface of a unit sphere $x^2 + y^2 + z^2 = 1$ using Lagrange's method.	CO2	4
Q5	A fluid flows through a pipe with circular cross-section of radius 1. The axial velocity distribution across the cross-section is given by $v(x, y) = 4 - (x^2 + y^2).$ The volume flow rate through the cross-section is defined as $Q = \iint_R v(x, y) dA$ where $R: x^2 + y^2 \leq 1$. Using the change of variables $x = r \cos \theta, \quad y = r \sin \theta,$ evaluate the total flow rate Q .	CO3	3

Q6	For the double integral $\int_0^1 \int_{x^2}^{\sqrt{x}} (x + y^2) dy dx$ a) (Sketch) Draw the region R and clearly shade it. b) By changing the order of integration, evaluate the double integral.	CO3	3
Q7	Using the Beta/Gamma function evaluate $\int_0^{\pi/2} \sin^{11} x \cos^{12} x dx$.	CO3	3
Q8	Using Gamma function evaluate $\int_0^1 (x \ln(1/x))^{1/3} dx$.	CO3	3