JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKE UP EXAMINATION (November 2025)

B.C.A. - I Semester

COURSE CODE (CREDITS): 25B11MA111 (3) MAX. MARKS: 25

COURSE NAME: FUNDAMENTALS OF MATHEMATICS

COURSE INSTRUCTORS: RKB*

MAX. TIME: 1 Hr 30 Mins

Note: All questions are compulsory. Use of scientific calculator is allowed. The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

Q.No	Question	CO	Marks
Q1	(a) If $A \cap B = A \cap C$ then is it necessary that $B=C$? Justify. (b) If $A \cup B = A \cup C$ then is it necessary that $B=C$? Justify.	CO-1	3
Q2	Let $f: R \to R$ be defined as $f(x) = 3x^2 - 4x + 5$, find $f^{-1}(2)$ and $f^{-1}(5)$.	CO-2	3
Q3	Suppose that the performance of an algorithm, the time complexity function is given by $T(n) = \frac{5n^3-3n^2+5}{7n^3-2n^2+5n-7}$; where n represents the input size. Find the performance for very large input size, i.e., $n \to \infty$.	CO-3	3
Q4	Suppose $f(x) = \begin{cases} a - bx, & x < 1 \\ 5, & x = 1 \\ b + ax, & x > 1 \end{cases}$ and if $\lim_{x \to 1} f(x) = f(1)$ then find the values of a and b.	CO-3	3
Q5	Find the slope of the tangent to the curve $y = \frac{3x-5}{2x+3}, x \neq -\frac{3}{2}$ at $x = 5$.	CO-3	3
Q6	The number of data packets received by a server at time t seconds is modeled by the function: $f(t) = \log(\cos(t^2 + 1))$. Find the derivative to find the rate of change of packets with respect to time. Also, evaluate this rate at $t = 3$ seconds.	CO-3	3
Q7	In computer graphics, an approximation of the cosine *function* is often used to render animations efficiently. Suppose we want to approximate $\cos x$ around $x = 0$ using Taylor's series. (a) Write the Taylor series expansion of $\cos x$ up to the x^4 term. (b) Use this expansion to approximate $\cos(0.1)$.	CO-3	4
Q8	In performance analysis of an algorithm, the execution time (in milliseconds) of a function depends on the size of the input n and is modeled by $T(n) = n^3 - 15n^2 + 70n + 50, \ n \geq 0$. (a) Find the critical points of $T(n)$. (b) Determine the values of n at which $T(n)$ attains a maximum or minimum.	CO-3	3

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