

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), January 2022

BCA, Semester I

Roll No.....

AS1104: MATHEMATICS

Time: 3 hours

Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow charts wherever required is an integral part of the answer.

Q.1A	If $A \subseteq B$, then what are $A \cap B$ and $A \cup B$? Answer using an example.	02
Q.1B	Let $A = \{a, b, c, d, e\}$, $B = \{a, b, c, d, f, g\}$, $C = \{b, c, e, y, h\}$, and $D = \{d, e, f, g, h\}$. Find: i. $B - (C \cup D)$ ii. $(A \oplus D) - B$	02
Q.1C	Determine the power set $(P(A))$ of set $A = \{a, b, c, d\}$.	01
Q.2A	For the functions $f: A \rightarrow B$, $g: B \rightarrow C$, and $h: C \rightarrow D$ defined in the figure below, answer the following questions: i. Which of the given functions is/are onto? ii. Which of the given functions is/are bijective? iii. Find $g \circ f(b)$	03
Q.2B	State the range of the function, $f(x) = (x + 1)^2 + 3$.	01
Q.2C	Let $R_1 = \{(1,1), (1,2), (2,3), (1,3), (4,4)\}$ be the relation defined on the set $A = \{1, 2, 3, 4\}$. Check whether the relation is reflexive or not. Justify your answer.	01
Q.3A	Consider the following function $f(x) = \begin{cases} 5x + 3, & x < 2 \\ 2x^2 + 5, & x \leq 2 < 4 \\ x^3 - 5x + 3, & x \geq 4 \end{cases}$ to find the limits, $\lim_{x \rightarrow 2} f(x)$ and $\lim_{x \rightarrow 4} f(x)$. Using the information obtained on limits, check the continuity of the function at $x = 2$ and $x = 4$.	03

Q.3B	Compute the derivative of the following functions: i. $f(x) = \frac{x^5 - \sin x}{\cos x}$ ii. $f(x) = x^2(20 - x^{-5})$	03
Q.3C	Find the second order derivative ($f''(x)$) of the function, $f(x) = \log x$	02
Q.4A	Find the intervals in which the function, $f(x) = -2x^3 - 9x^2 - 12x + 1$ is increasing or decreasing. Using that determine the point of local maxima or local minima, if there is/are any.	03
Q.4B	The volume of a sphere is increasing at the rate of 3 cubic centimeter per second. Find the rate of increase of its surface area when the radius is 2 cm.	02
Q.4C	Find the approximate value of $(2.001)^5$	02
Q.5A	Integrate the following: i. $\int x^3 \left(x^3 + 1 + \frac{1}{x^3} \right) dx$ ii. $\int \frac{2 - 3 \cos(4x)}{\sin^2(4x)} dx$	03
Q.5B	Find the area underneath the curve $y = x^2 + 2$ from $x = 1$ to $x = 4$.	02