

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2022

BCA, Semester I

Roll No.....

AS1104: MATHEMATICS

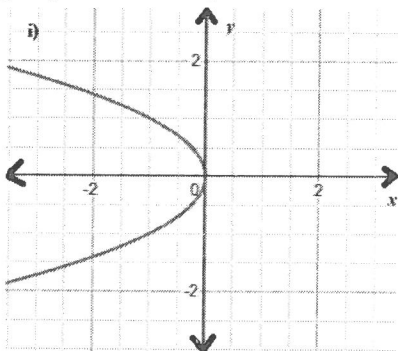
Time: 3 hours

Max. Marks: 40

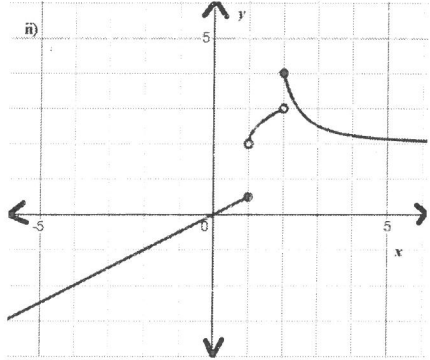
Instructions to students:

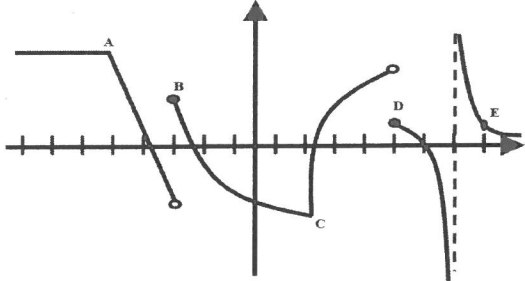
1. Do not write anything other than your roll number on the question paper.
2. All questions are compulsory.

- Q.1A** Find the number of proper subsets of the set $\{a, b, \{c, d\}\}$. 1.0
(LO-1)
- Q.1B** State true or false with proper reasons: 2.0
(LO-1)
- i) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets.
 - ii) $\{1, 2, 3, 4\}$ and $\{x : x \text{ is a natural number and } 4 < x \leq 6\}$ are disjoint sets.
- Q.1C** If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$, $A = \{1, 3, 5, 7, 9, 11\}$ and $B = \{7, 9, 11\}$, then find A^c and $(A \cap B)^c$, where U represents universal set. 2.0
(LO-1)
- Q.1D** Write the elements of the following sets described in set-builder form: 2.0
(LO-1)
- i) $A = \{x : x \text{ is a natural number, } x < 5 \text{ and } x > 7\}$
 - ii) $B = \{x : x \text{ is an odd natural number less than } 10\}$
 - iii) $C = \{x : x \text{ is a letter in the word FOLLOW}\}$
 - iv) $D = \{x : x \text{ is an even prime number}\}$
- Q.2A** Determine which of the following curves are graphs of functions (Give proper reasons): 2.0
(LO-3, 4)
- i)



ii)


- Q.2B** Find the domain and range of any **TWO** of the following functions: 2.0
(LO-3, 4)
- i) $f(x) = \sqrt{x^2 + 1}$
 - ii) $g(x) = \frac{x+1}{2}$
 - iii) $h(x) = 2 \sin 2x$
- Q.2C** Show that 1.0+2.0
(LO-3, 4)
- i) the relation R on the set of real numbers, defined as $R = \{(a, b) : a \leq b^2\}$ is not reflexive.
 - ii) the relation R on the set $\{1, 2, 3\}$, defined as $R = \{(1, 2), (2, 1)\}$ is symmetric but not transitive.

- Q.3A** Prove that $P_r^n = r! C_r^n, 0 < r \leq n$. 1.0
(LO-2)
- Q.3B** Mr. Gupta owns 4 pairs of pants, 7 shirts, and 3 sweaters. In how many ways may he choose 2 of the pairs of pants, 3 of the shirts, and 1 of the sweaters to pack for a trip? 2.0
(LO-2)
- Q.3C** How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that 2.0
(LO-2)
- repetition of the digits is allowed?
 - repetition of the digits is not allowed?
- Q.3D** If the second and the third term of geometric series are 18 and 6, respectively, then find the common ratio, first term and the sum of infinite terms. 2.0
(LO-5)
- Q.3E** Write the function, $(1 - x)^{-2}$ as infinite series in ascending powers of x and state the condition on x where the expansion is valid. 2.0
(LO-5)
- Q.4A** Determine the following limits: 2.0
(LO-3)
- $\lim_{x \rightarrow 0} \frac{\cos x}{\pi - x}$
 - $\lim_{x \rightarrow -3} \frac{x+3}{x^2+x-6}$
- Q.4B** In the following graph, at what points out of A, B, C, D and E, does the function appear to be: 2.0
(LO-3)
- Continuous but not differentiable
 - Neither continuous nor differentiable
- 
- Q.4C** Find the derivative of any **TWO** of the following functions: 4.0
(LO-3)
- $\frac{7}{x^5} + \frac{2}{x^3} + x^3$
 - $\ln(e^x + e^{-x})$
 - $\frac{\cos x}{1 + \sin x}$
- Q.4D** Find the point of local maxima and local minima, if any, of the function, 3.0
(LO-3, 5)
- $$f(x) = x^3 - 3x.$$
- Also, find the local maximum and the local minimum values, as the case may be.
- Q.5A** Evaluate the following integrals: 4.0
(LO-4)
- $\int (5 \sin x + e^{2x} + \sec^2 x) dx$
 - $\int_1^2 (4x^3 - 5x^2 + 6x + 9) dx$
- Q.5B** Find the area under the curve $y = \cos x$ over the interval $[-\pi/2, \pi/2]$. 2.0
(LO-4, 5)