

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, JULY 2013

(CCSS)

CA 1C 01—MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

Time : Three Hours

Maximum : 30 Weightage

Part A (Objective Type Questions)*Answer all twelve questions.*

Choose the correct answer from the following.

- Which of the following is an example of a finite set ?
 (a) Set of even prime numbers. (b) $\{x : x \text{ is a natural number, } x > 5\}$
 (c) The set of months of a year. (d) The set of prime numbers.
- If $A = \{1, 2\}$ and $B = (2, 3, 4)$, then what is $A \cap B$?
 (a) $\{2\}$. (b) $(1, 2, 3, 4)$.
 (c) ϕ . (d) $(1, 2)$.
- $\lim_{r \rightarrow \infty} \pi r^2$ is
 (a) π . (b) 0.
 (c) 1. (d) ∞ .
- Derivative of $\sin(x+1)$ w.r.t. x is :
 (a) $\cos x$. (b) x .
 (c) $\cos(x+1)$. (d) 0.
- The solution of set of equations $x^2 - 2x + 4 = 0$ is _____
- If set A has P elements and B has q elements then the total number of a relations are _____
- If $F : X \rightarrow Y$ is onto if range of $F =$ _____
- If $X = \{1, 2, 3, 4, 5, 6\}$, $A = \{1\}$ and $B = \{2, 4\}$ then $A \cap B$ is _____
- Is the function defined by $f(x) = x$ an identity function ?
- Let A be a set of **all books**. Is A a set ?

Turn over

11. Length of the interval (2, 4) is 4.

True or False

12. Is derivative of 3 w.r.t. x 1?

(12 x a = 3 weightage)

Part B (Short Answer Questions)

Answer all questions.

13. Show that an onto function $F : \{1, 2, 3\} \rightarrow \{1, 2, 3\}$ must be one-one?

14. Define disjoint set and give an example for it.

15. If $A = \{2, 4, 6\}$ and $B = \{1, 2, 3, 4, 5\}$. Find $A \cup B$, $A \cap B$ and $A - B$.

16. Find the derivative of $f(x) = \cot x$ w.r.t. x .

17. Let $S = \{1, 2, 3\}$. Determine whether the functions $F : S \rightarrow S$ defined below have inverses.

(a) $F = \{(1, 1), (2, 2), (3, 3)\}$.

(b) $F = \{(1, 2), (2, 1), (3, 1)\}$.

18. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = x^2$ is neither one-one nor onto.

19. Find $\lim_{x \rightarrow \infty} \frac{\sqrt{1+x} - 1}{x}$

20. Let $A = \{1, 2, 3\}$, $B = \{3\}$ and $C = W$. Find $(A \times B) \cap (A \times C)$.

21. Find the domain and range of the function $f(x) = \frac{1}{x}$.

(1 x 1 = 9 weightage)

Part C (Short Essay Questions)

Answer any five questions.

22. Find $g \circ f$ and $f \circ g$ if $f : \mathbb{R} \rightarrow \mathbb{R}$ and $g : \mathbb{R} \rightarrow \mathbb{R}$ are given by $f(x) = 6x + 2$ and $g(x) = 3x^2$

23. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student likes to play at least one of the two games. How many students like to play both cricket and football.

24. Find the derivative of $f(x) = \cot x$.

25. Define equivalence relation.

26. Find the derivative of $\sin^e x$ w.r.t. x .

27. Find the derivative of the function $f(x) = x^2 + 3x - 5$ at $x = -1$. Also prove that $f'(0) = 3$.
28. Let $L = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$. Find $A \cap B$, $A \cup B$ and hence show that $(A \cap B) = A \cap (A \cup B)$.

(5 x 2 = 10 weightage)

Part D (Essay Questions)*Answer any two questions.*

29. From first principles, find the derivative of $x \frac{\cos x}{\tan x}$ w.r.t. x .
30. Show that $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0$.
31. Show that $f: \mathbb{N} \rightarrow \mathbb{N}$ given by

$$f(x) = \begin{cases} x + 1, & \text{if } x \text{ is odd} \\ x - 1, & \text{if } x \text{ is even} \end{cases}$$

is both one-one and onto.

(2 x 4 = 8 weightage)