

FIRST SEMESTER **B.C.A.** DEGREE EXAMINATION, JANUARY 2014

(UG-CCSS)

Complementary Course

## CA IC 01—MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

Time : Three Hours \_\_\_\_\_

Maximum : 30 Weightage

## Part A (Objective Type Questions)

*Answer all twelve questions.*1. Which of the following is an example of **singleton** set ?

- (a) Set of even prime numbers.  
 (b)  $\{x : x \text{ is a natural number, } x \geq 5 \text{ and } x \leq 7\}$ .  
 (c) The set of months of the year.  
 (d) The set of prime numbers less than 99.

2. If  $A = \{1, 2\}$  and  $B = \{2, 3, 4\}$ , then what is  $A \cap B$  ?

- (a)  $\{2\}$ . (b)  $\{1, 2, 3, 4\}$ .  
 (c)  $\phi$ . (d)  $\{1, 2\}$ .

3.  $\lim_{x \rightarrow 2} 2x + 3$  is :

- (a) 0. (b) 3.  
 (c) 7. (d)  $-\infty$ .

4. Derivative of  $\log_x$  w.r.t.  $x$  is :

- (a)  $\frac{1}{x}$ . (b)  $x$ .  
 (c) 1. (d) 0.

5. The solution of set of equations  $x^2 - 2x + 4 = 0$  is \_\_\_\_\_6. Let  $n(A) = p$  and  $n(B) = q$ , then  $n(A \times B)$  \_\_\_\_\_7. If  $f: X \rightarrow Y$  is onto if the range of  $f =$  \_\_\_\_\_8. If  $X = \{1, 2, 3, 4, 5, 6\}$ ,  $A = \{1, 2, 3\}$  and  $B = \{2, 4, 5\}$ , then  $A \cap B$  is \_\_\_\_\_

Turn over

9. Is the function defined by  $f(x) = x$  an identity function ?
10. Let A be a set of novels written by the writer **Munshi Prem Chand**. Is A a set ?
11. Let  $f: A \rightarrow B$  be a relation, then range of  $f$  is **codomain**. True or False.
12.  $((A^c)^c)^c = A$ . True or False.

(12 x 1/4 = 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 power set and give an example for it.
15. Show that  $A \cup B = A \cap B$  implies  $A = B$ .
16. Find the derivative of  $f(x) = \sin x$  w.r.t.  $x$  by first principle.
17. Show that if  $f: A \rightarrow B$  and  $g: B \rightarrow C$  are one-one, then  $g \circ f: A \rightarrow C$  is also one-one.
18. Show that the function  $F: \mathbb{N} \rightarrow \mathbb{N}$  given by  $F(1) = F(2) = 1$  and  $F(x) = x - 1$  for every  $x \geq 2$  is onto, but not one-one.
19. Find  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$ .
20. Let  $A = \{1, 2, 3\}$ ,  $B = \{3\}$  and  $C = \{1\}$ . Find  $(A \times B) \cap (A \times C)$ .
21. Find the domain and range of the function  $f(x) = \frac{1}{2}$ .

(9 x 1 = 9 weightage)

**Part C (Short Essay Questions)***Answer any five questions.*

22. If  $f: X \rightarrow Y$ ,  $g: Y \rightarrow Z$  and  $h: Z \rightarrow S$  are functions, then  $h \circ (g \circ f) = (h \circ g) \circ f$ .
23. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student like to play **atleast** one of the two games. How many students like to play both cricket and football.
24. Find the derivative of  $f(x) = x \sin x$ .
25. Define Equivalence relation.
26. Find  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x}$ .

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

(5 x 2 = 10 weightage)

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

29. Let  $f: X \rightarrow Y$  and  $g: Y \rightarrow Z$  be two invertible functions. Then  $g \circ f$  is also invertible with  $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ .

30. Find  $\lim_{x \rightarrow 2} \frac{x^2 - 2x^2}{x^2 - 5x + 6}$

31. For any sets A and B, show that  $P(A \cap B) = P(A) \cap P(B)$ .

(2 x 4 = 8 weightage)