

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) $\{x : x \text{ is a natural number, } x > 5 \text{ and } x < 7\}$.
- (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) ϕ .
- (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 $f \subseteq$ codomain. True or False.
12. $((A'))' = A$. True or False.

(12 x $\frac{1}{4}$ = 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 $x > 2$ is onto, but not one-one.
19. Find $\lim_{x \rightarrow 1} \frac{x'' - 1}{x - 1}$.
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 $f(x) = \frac{1}{x^2}$.

(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 $\lim_{x \rightarrow 2} \frac{x^3 - 2x^2}{x^2 - 5x + 6}$.
31. For any sets A and B, show that $P(A \cap B) = P(A) \cap P(B)$.

(2 x 4 = 8 weightage)