

D 73139

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Name.....

Reg. No.....

FIRST SEMESTER B.A./B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(CUCBCSS—UG)

BCA

BCA 1C 02—DISCRETE MATHEMATICS

(Common for 2014 and 2017 Admissions)

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all questions.

Each question carries 1 mark.

1. Define Antisymmetric relation.
2. Construct the truth table for the proposition $\sim(\sim p \wedge q)$.
3. Define greatest lower bound of a poset.
4. Let $A = \{x \in \mathbb{N} / 3 \leq x < 7\}$, $B = \{2, 3, 5, 7, 11\}$ find $A \Delta B$.
5. Define a finite graph.
6. What is a subgraph.
7. Define a complete graph.
8. State maximum flow minimum cut theorem.
9. Define centre of a tree.
10. Define digraph.

(10 × 1 = 10 marks)

Section B

Answer all questions.

Each question carries 2 marks.

11. In a Boolean Algebra $(B, +, \cdot, ')$ each $a \in B$ $(a')' = a$.
12. Translate into logical expression "A necessary condition for x to be prime is that either x is odd or $x = 2$ ".

Turn over

13. If $A = \{1, 3, 5, 7, 9\}$ $B = \{2, 3, 5, 7, 11\}$ find $A - B$, $B - A$ and $A \Delta B$.
14. Define a tree and draw all trees with 4 vertices.
15. Explain logical equivalent and logical consequences of a proposition.
16. Show that $\overline{A \cap B} = \overline{A} \cup \overline{B}$.
17. Define chromatic graph. Give an examples.
18. Draw a disconnected graph with 8 vertices and 2 components.

(8 × 2 = 16 marks)

Section C

Answer any six questions.

Each question carries 4 marks.

19. Distinguish between symmetric and transitive relation with suitable examples.
20. Describe Hasse diagram with examples.
21. Show that $\sim(p \wedge q)$ and $\sim p \vee \sim q$ are logically equivalent.
22. Which elements of the poset $(\{2, 4, 5, 10, 12, 20, 25\}, 1)$ are maximal and which are minimal?
23. Prove that the number of vertices of odd degree in a graph is always even.
24. Prove that any connected graph with n vertices and $n - 1$ edges is a tree.
25. Show that in any tree there are atleast 2 pendant vertices.
26. Any simple graph can be embedded in a plane such that every edge is drawn as a straight line segment, verify?
27. Prove that the edge connectivity of a graph G can not exceed the degree of the vertex with the smallest degree in G .

(6 × 4 = 24 marks)

Section D

Answer any three questions.

Each question carries 10 marks.

28. (a) Define power set of a set and Cartesian product with suitable examples. Also find $P(A)$, $P(B)$, $A \times B$ and $B \times A$ if $A = \{1, 2, 3\}$; $B = \{4, 5, 6, 7\}$.
- (b) Show that $\sim(p \vee (\sim p \wedge q))$ and $(\sim p \wedge \sim q)$ are logically equivalent.

29. (a) Draw Hasse diagram representing the partial ordering $\{(a, b) / a \text{ divides } b\}$ on $\{1, 2, 3, 4, 6, 8, 12\}$.
- (b) Show the Boolean Expressions $(x_1, x_2) \cdot x_3$ and $x_1 \cdot (x_2, x_3)$ are equal.
30. Define planar graph and prove that a graph has a dual iff it is planar.
31. (a) Prove that every tree has either one or two centre.
- (b) Prove that every circuit has an even number of edges in common with any cut-set.
32. (a) A connected graph is Euler graph iff it can be decomposed into circuits.
- (b) The max vertex connectivity of a graph G with n vertices and edges ($e \geq n - 1$) is the integral

part of the number $\frac{2e}{n}$.

(3 × 10 = 30 marks)

