D 73139 (Pages : 3) 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 $A = \{x \in N / 3 \leq x < 7\}, B = \{2, 3, 5, 7, 11\}$ 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, +, . , ') 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 $A \triangle B$.

14. Define a tree and draw all trees with 4 vertices.

15. Explain logical equivalent and logical consequences of a proposition.

16. Show that $A \cap B = A \cup \overline{B}$.

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}, |) 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 × B and B × A if A = {1, 2, 3}, B = {4, 5, 6, 7}.

    (b) Show that $\neg(p \vee (\neg p \wedge q))$ and $(\neg p \wedge \neg q)$ are logically equivalent.

29. (a) Draw Hasse diagram representing the partial ordering $\{(a, b)/\ a$ 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)