FIRST SEMESTER DEGREE EXTERNAL EXAMINATION DEC./JAN. 2015 -16

(2015 Admission)

CC15UBCA1C02 – DISCRETE MATHEMATICS (Complementary)

Time: 3 Hours   **Max. Marks: 80 Marks**

PART A

*Answer **all** questions*

1. Write the truth table of $p \to q$.
2. Let $R = \{(a, b) : a < b$ where $a, b \in \mathbb{Z}\}$ be a relation on $\mathbb{Z}$, set of all integers. Check whether the relation is reflexive.
3. Let $A = \{0,1,2, ..., 100\}$ and let aRb if and only if a divides b. Find minimal element of A.
4. Find the dual of the statement $(1 + a) * (b + 0) = b$.
5. Give an example of a multigraph.
6. Give examples of 2-regular graph and 3-regular graph.
7. Draw a graph with edge connectivity 2.
8. Define directed graph. Give an example of a directed graph.
9. Define path and give an example of path.
10.
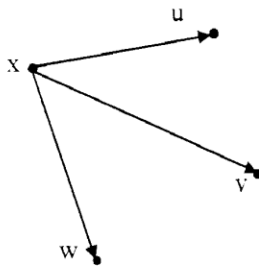
Find in degree and out degree of each vertex. $(10x1 = 10\ marks)$

PART B

*Answer **all** questions*

11. Show that $(p \to q) \leftrightarrow \neg\ pvq$ is a tautology.
12. Find negation of   1) $\forall\ x\ \exists\ y\ P(x,y)$

                         2)$\forall\ x\ \forall\ y\ P(x,y)$
13. State max-flow min-cut theorem.

14. Let $R = \{(a, b) : a, b \in A,$ a divides b$\}$ be a relation, where $A = \{1,2, \ldots \ldots .,36\}$. Draw Hasse diagram for the order relation.

15. If r is the radius and d is the diameter of the connected graph G, prove that $r \leq d \leq 2r$.

$(5x2 = 10\ mar$

PART C

Answer *any five* questions

16. $K_{3,3}$ is not planar. Explain.

17. Define different types of connectivity in digraphs with examples.

18. Suppose a travelling salesman required to visit four cities P, Q, R, S during a trip. The dista between every pair of cities (in km) are given in the following table

	Q	R	S
P	45	40	35
Q		32	18
R			44

Find the minimum distance for covering all the cities.

19. Find all the spanning trees of K_4.

20. Define isomorphism between two graphs. Give an example of two graphs which isomorphic.

21. What is a subgraph? Draw a graph and three subgraphs of it.

22. Using an example find the minimum spanning tree using Kruskal's algorithm.

23. Define greatest lower bound and least upper bound with example.

$(5x4 = 20\ marks)$

PART D

Answer *any five* questions

24. Define Hamiltonian graph. Explain all terms related to it. Draw a graph.

25. What is an equivalence relation? Give examples of an equivalence relation and nonequivalence relation.

26. What is Boolean algebra? What are the properties?

27. a) Draw the union of P_3 and C_6

   b) Prove that in a graph G every walk contains a path.

28. Explain dual of a graph with example.

29.
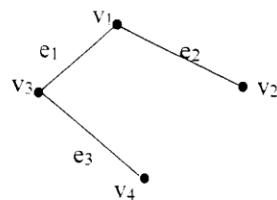
Write the adjacency matrix and incidence matrix of the given graph.

30. What are the different types of logic gates and explain.
31. Determine the truth value of each of these statements if the domain consists of all integers
    a) $\forall n \, \exists m \, (n^2 < m)$
    b) $\exists \, n \, \forall m (n < m^2)$

$(5x8 = 40 \, marks)$

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