JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- MAY-2023

COURSE CODE(CREDITS): 18B11CI414 (3) MAX. MARKS: 35

COURSE NAME: DISCRETE COMPUTATIONAL MATHEMATICS

COURSE INSTRUCTOR: RKB, BKP, PKP* MAX. TIME: 2 Hours

Note: *All questions are compulsory. Marks are indicated against each question in square brackets*

1. (a) For two sets A and B, find the dual of statement "$A \subseteq B$." Also, list all the fundamental products of three sets A, B and C and show them with the help of Venn Diagram. [3] [CO3]

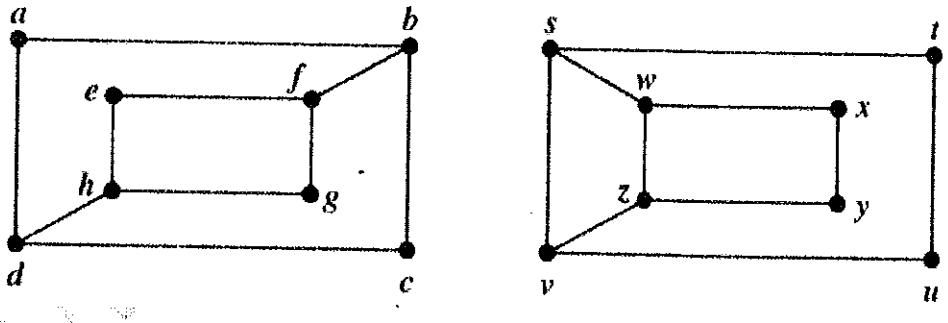
(b) Check the validity of the following argument with the help of truth table: [2] [CO3]
If it snows, then streets get slippery. If the streets get slippery, then accidents happen. Accidents do not happen. Therefore, it does not snow.

2. (a) Using mathematical induction show that $1^2 + 3^2 + \cdots + (2n-1)^2 = \frac{(4n^3-n)}{3}, \forall n \in \mathbb{Z}^+$. [3] [CO2]

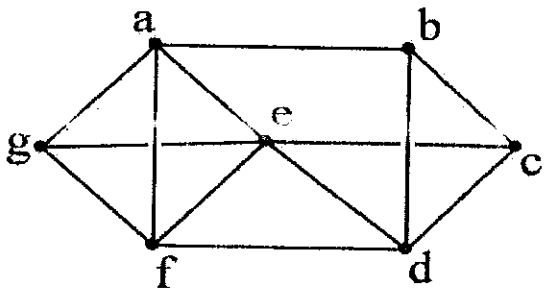
(b) Dirac's theorem states that "if G is a simple graph with n vertices with $n \geq 3$ such that the degree of every vertex in G is at least $n/2$ then G has a Hamilton circuit." Give an example to disprove the converse of the theorem. Write the contrapositive of the theorem. Also, give an example of a Eulerian graph which is not a Hamilton. graph. [3] [CO2]

3. (a) Draw wheel graph W_6 on 6 vertices, and verify the Euler's formula for it. [4] [CO4]

(b) Using definition of graph Isomorphism prove or disprove that the following graphs are isomorphic: [2]

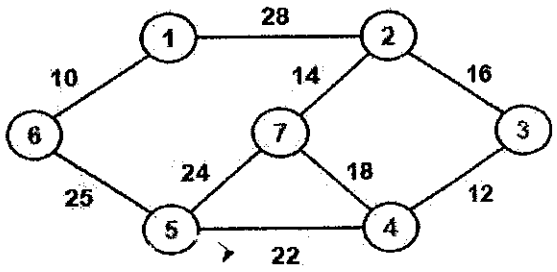


4. (a) Using the Welsh Powell algorithm color the following graph, and write its chromatic number: [4]



(b) Evaluate the prefix expression $+ - * 2\ 3\ 5\ /\ \uparrow\ 2\ 3\ 8$ [2] [CO4]

5. (a) Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm, also find the cost (or weight) of MST. [3] [CO6]



(b) Show that set $G = \{1,\ w,\ w^2\}$; is an Abelian group under usual multiplication where $w^3 = 1$. [3]

6. Show that $(z_5,\ +_5,\ \times_5)$ is a Ring with zero divisors where $+_5$, $\times_5$ are addition and multiplication modulo 5 respectively. [6] [CO6]

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