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[5459]-181

S.E. (Computer) (First Semester) EXAMINATION, 2018

DISCRETE MATHEMATICS

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6,
Q. No. 7 or 8.

(ii) Assume suitable data wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Draw neat and labelled diagram wherever necessary.

1. (a) By using mathematical induction show that : [4]

$1 + 2 + 3 + \dots + n = n(n + 1)/2$ for all natural number values of n .

(b) Use : [2]

p : I will study discrete structure

q : I will go to a movie

r : I am in a good mood.

Write the English sentence that corresponds to each of the following :

(i) $\sim r \rightarrow q$

(ii) $\sim q \wedge p$

(iii) $q \rightarrow \sim p$

(iv) $\sim p \rightarrow \sim r$.

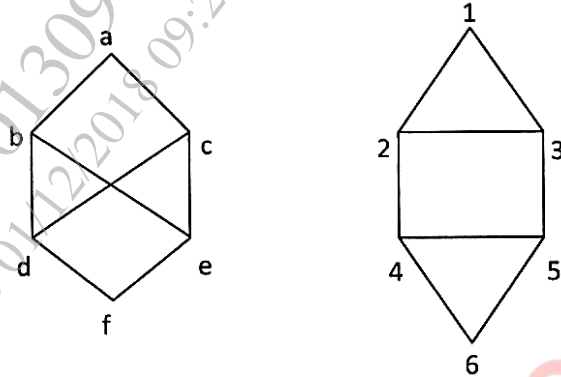
P.T.O.

- (c) Let $R = \{(1, 4), (2, 1), (2, 5), (2, 4), (4, 3), (5, 3), (3, 2)\}$ on the set $A = \{1, 2, 3, 4, 5\}$. Use Warshall's algorithm to find transitive closure of R . [6]

Or

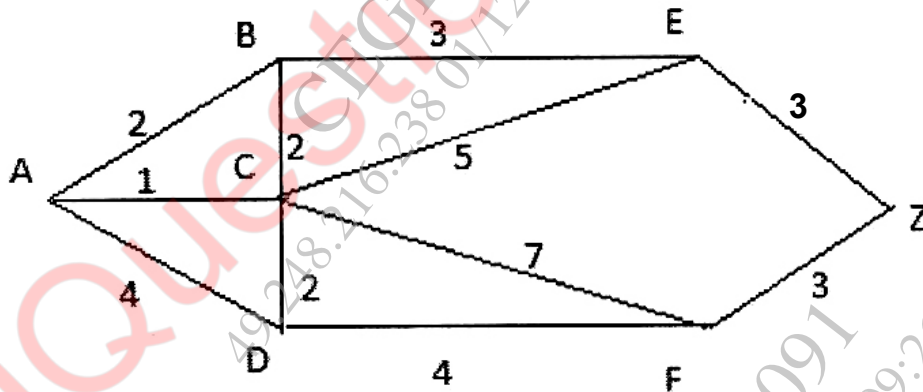
2. (a) 100 sportsmen were asked whether they play cricket, football or hockey. Out of these 45 play cricket, 21 play football, 38 play hockey, 18 play cricket and hockey, 9 play cricket and football, 4 play football and hockey and 23 play none of these. Find the number of sportsmen who play : [6]
- (i) exactly one of the games
 - (ii) exactly two of the games.
- (b) $A = \{1, 2, 3, 4\}$, $B = \{1, 4, 6, 8, 9\}$; aRb iff $b = a^2$. Find the domain, range of R . Also find its relation matrix and draw its diagram. [6]
3. (a) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done ? [3]
- (b) How many 4-letter words with or without meaning, can be formed out of the letters of the word 'LOGARITHMS', if repetition of letters is not allowed ? [3]

- (c) Determine whether the two graphs are isomorphic or not.
Explain. [6]



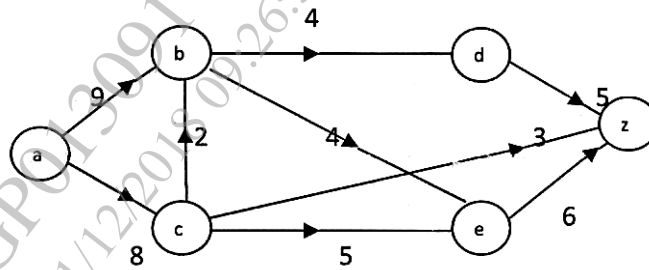
Or

4. (a) Use Dijkstra's algorithm to find the shortest path between A and Z in figure : [6]



- (b) If a committee has eight members : [6]
- How many ways can the committee members be seated in a row ?
 - How many ways can the committee select a president, vice-president and secretary ?

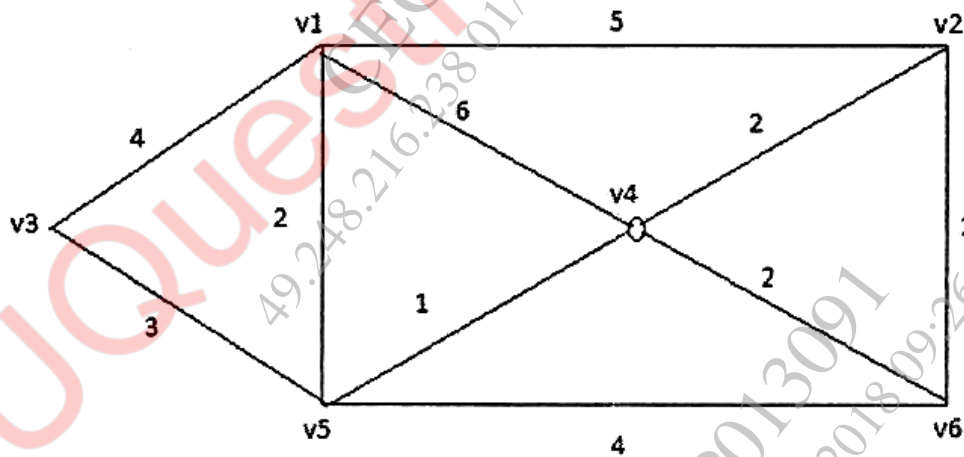
5. (a) Find maximum flow in the transport network using labeling procedure. Determine the corresponding min cut : [7]



- (b) Define the following terms : [6]
- (i) Level and height of a tree
 - (ii) Cut points
 - (iii) Eccentricity of a vertex.

Or

6. (a) Find minimum spanning tree for the graph shown below using Kruskal's algorithm. [7]



- (b) Suppose data items A, B, C, D, E, F, G occur in the following frequencies respectively 10, 30, 5, 15, 20, 15, 5. Construct a Huffman code for the data. What is the minimum weighted path length ? [6]

7. (a) Let $Z_n = \{0, 1, 2, \dots, n-1\}$. In Z_{12} what is the order of 3, 6 and 8. [3]
- (b) Let $(Q, *)$ is an Algebraic system. $*$ is a binary operation defined as $a * b = a + b - ab \quad \forall a, b \in Q$. Determine whether $(Q, *)$ is a group. [4]
- (c) Define : [6]
- (i) Rings
 - (ii) Integral domain
 - (iii) Field.

Or

8. (a) Let $Z_n = \{0, 1, 2, \dots, n-1\}$. Let $*$ be a binary operation such that $a * b = \text{remainder of } (a + b) \text{ divided by } n$. Construct a table for $n = 4$. Is $(Z_4, *)$ a monoid, semigroup, group and abelian group. [7]
- (b) Define : [6]
- (i) Group code
 - (ii) Galois theory
 - (iii) Cyclic group.