

Total No. of Questions—8]

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

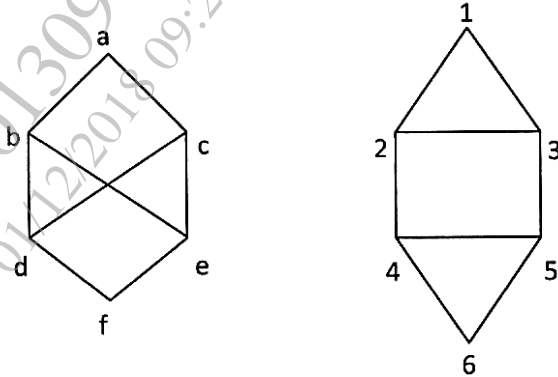
P.T.O.

- (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*

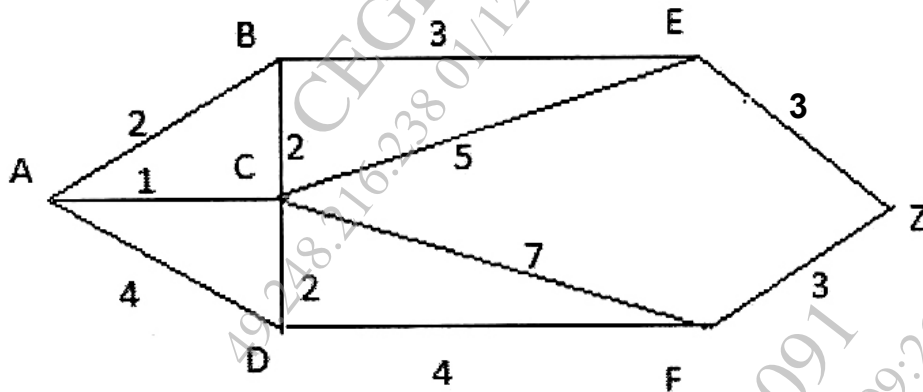
2. (a) 100 sportsmen were asked whether they play cricket, football or hockey. Out of these 45 play cricket, 21 play football, 38 play hockey, 18 play cricket and hockey, 9 play cricket and football, 4 play football and hockey and 23 play none of these. Find the number of sportsmen who play : [6]
- (i) 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]



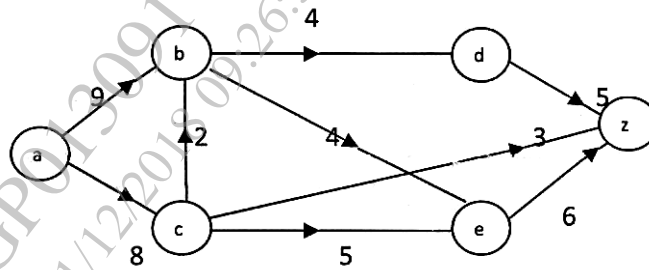
Or

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 ?

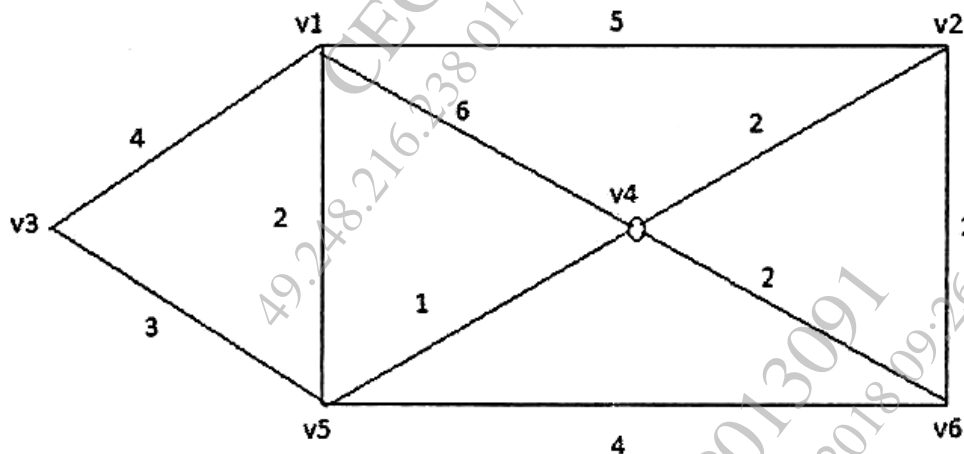
5. (a) Find maximum flow in the transport network using labeling procedure. Determine the corresponding min cut : [7]



- (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  $(\mathbf{Q}, *)$  is an Algebraic system.  $*$  is a binary operation defined as  $a * b = a + b - ab \quad \forall a, b \in \mathbf{Q}$ . Determine whether  $(\mathbf{Q}, *)$  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.