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[5057]-269

S.E. (Information Technology) (First Semester)

EXAMINATION, 2016

DISCRETE STRUCTURE

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and
Q. 7 or Q. 8.

(ii) Neat diagram must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of calculator is allowed.

(v) Assume suitable data, if necessary.

1. (a) Using law of propositions prove equivalence : [6]

(i) $(p \vee q) \wedge \sim p = \sim p \wedge q$

(ii) $p \wedge (q \wedge r) \vee (q \wedge r) \vee (p \wedge r) \leftrightarrow r$.

(b) Determine the Hasse diagram for the relation R. A = {1, 2, 3, 4} : [6]

$$R = \{(1, 1), (1, 2), (2, 2), (2, 4), (1, 3), \\ (3, 3), (3, 4), (1, 4), (4, 4)\}$$

P.T.O.

Or

2. (a) Using mathematical induction, prove that : [6]

$$1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n+1)(2n-1)}{3}.$$

- (b) Let $A = \{1, 2, 3, 4\}$ and let

$$R = \{(1, 1), (1, 2), (1, 4), (2, 4), (3, 1), \\ (3, 2), (4, 2), (4, 3), (4, 4)\}.$$

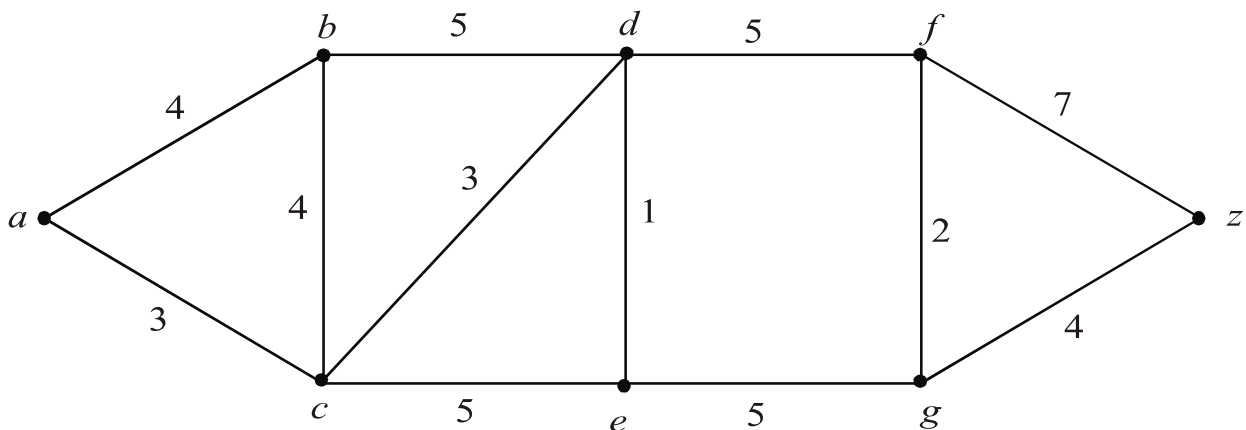
Find Transitive closure of R using Warshall's algorithm. [6]

3. (a) What is Hamming Distance ? Given parity check matrix : [6]

$$H = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

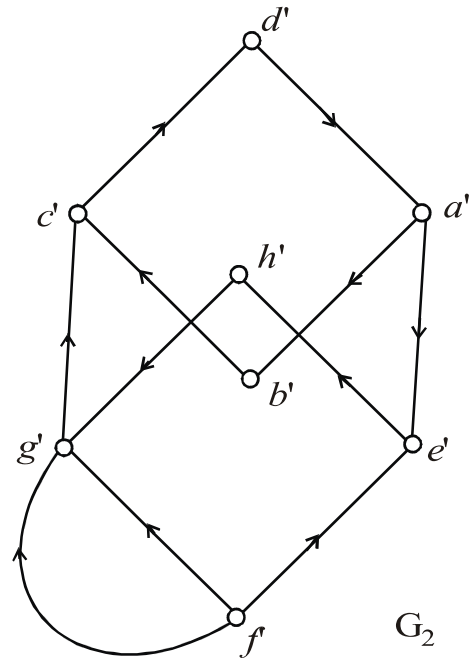
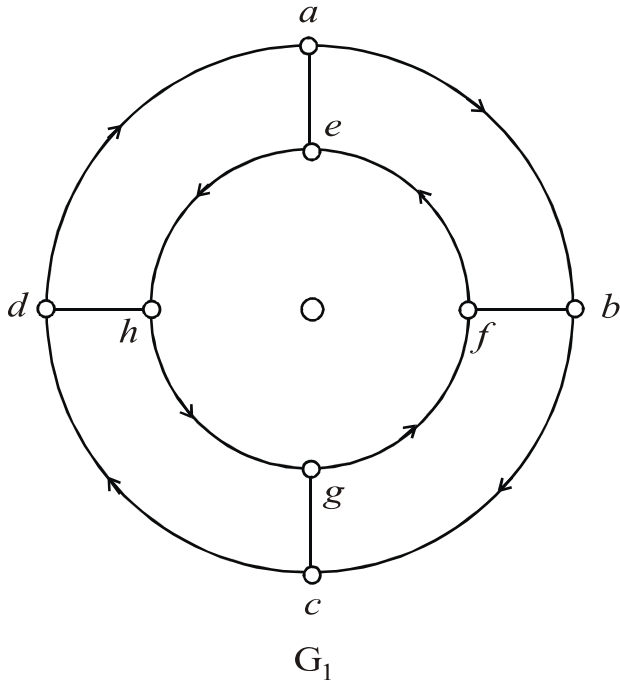
Find minimum distance of code generated by H . How many errors can it detect and correct ?

- (b) Find the shortest path from a to z , using Dijkstra's Algorithm. [6]



Or

4. (a) Are the following graphs isomorphic? Explain your answers. [6]



(b) Define :

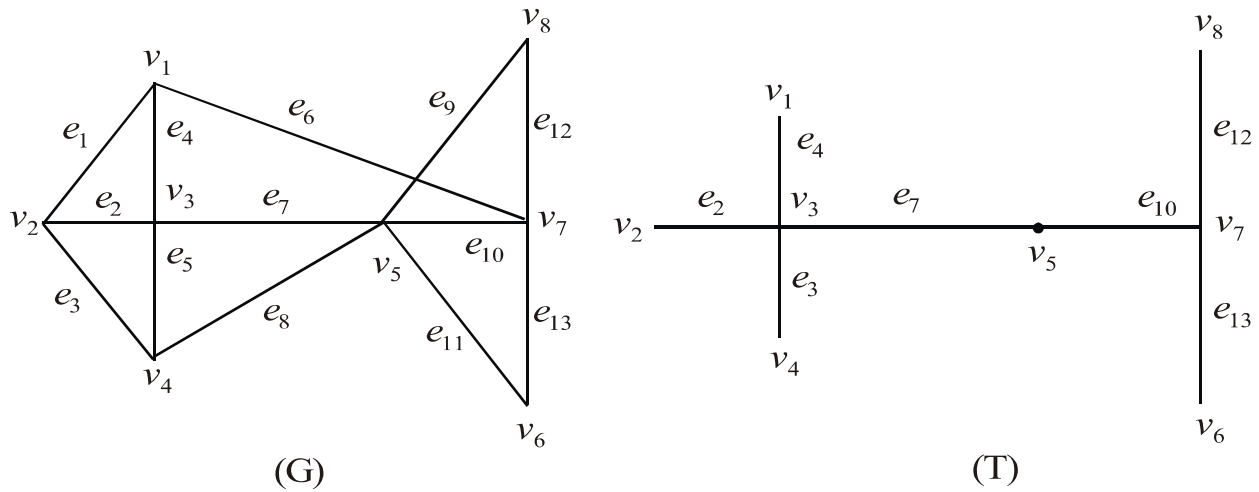
- (i) Group
- (ii) Abelian group
- (iii) Ring
- (iv) Isomorphic group
- (v) Sub-monoid
- (vi) Semi-group.

[6]

5. (a) Define prefix code. For the following set of weight, construct the optimal binary prefix tree. For each of the weight in the set, give the corresponding prefix code : [7]

6, 1, 2, 4, 5, 9, 12, 10, 15.

(b) Define cut set. Find fundamental system of cut set for the graph G shown below with respect to the spanning tree T. [6]

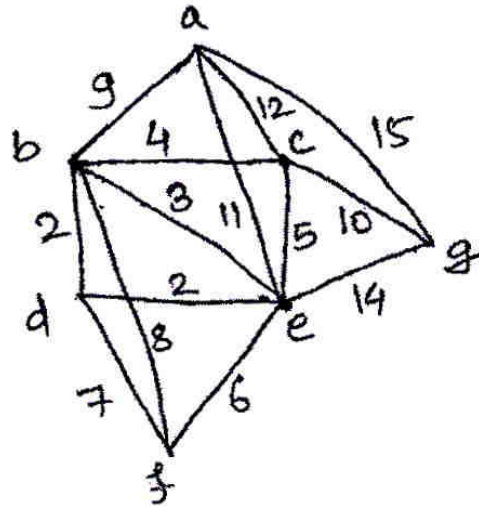


Or

6. (a) Define : [6]

- (i) Binary Tree
- (ii) M-ary tree
- (iii) Prefix code
- (iv) Inorder Traversal
- (v) Eccentricity of a vertex
- (vi) Post-order Traversal.

- (b) Find the Minimal Spanning Tree for the graph below using Prim's algorithm. [7]



7. (a) Two dice are rolled together. Event A denotes that the sum of the numbers on the top faces is even and event B denotes that there is a 4 on at least one of the top faces.

Find : [7]

$$P(A \cup B) \text{ and } P(A \cap B).$$

- (b) Find number of arrangements that can be made out of letters : [6]

(i) MISSISSIPPI

(ii) MALAYALAM.

Or

8. (a) In a certain survey of students it was found that 40% like cricket, 50% like hockey and 25% likes both. Find probability for : [6]
- (i) A student liking only cricket
 - (ii) A student liking only hockey.
- (b) (i) What is addition theorem for mutually exclusive events ?
- (ii) A card is drawn from a desk of cards. Find probability of getting a king or a heart or a red card. [7]