

Total No. of Questions—8]

[Total No. of Printed Pages—4+2

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[4657]-589

S.E. (Information Technology) (I Sem.) EXAMINATION, 2014

DISCRETE STRUCTURE

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

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

(ii) Neat diagrams 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) During a survey of the ice cream preferences of students, it was found that 22 like mango, 25 like custard apple, 39 like grape, 9 like custard apple and mango, 17 like mango and grape, 20 like custard apple and grape, 6 like all flavours and 4 like none. Then how many students were surveyed ? How many students like exactly one flavour, how many students like exactly two flavours ? [6]

P.T.O.

- (b) What is recurrence relation ? Solve the following recurrence relation :

$$a_r - 7a_{r-1} + 10a_{r-2} = 0$$

given that $a_0 = 0$ and $a_1 = 3$. [6]

Or

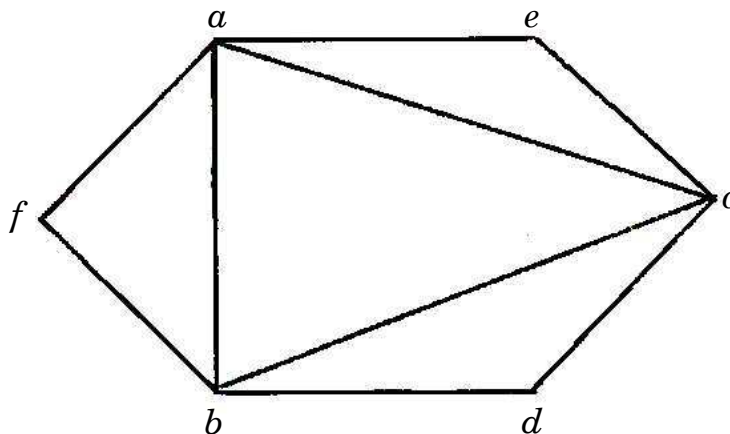
2. (a) State the principle of Mathematical Induction, using mathematical induction prove the following proposition : [6]

$$P(n) = 1 + 4 + 7 + \dots + (3n - 2) = \frac{n(3n - 1)}{2}.$$

- (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]

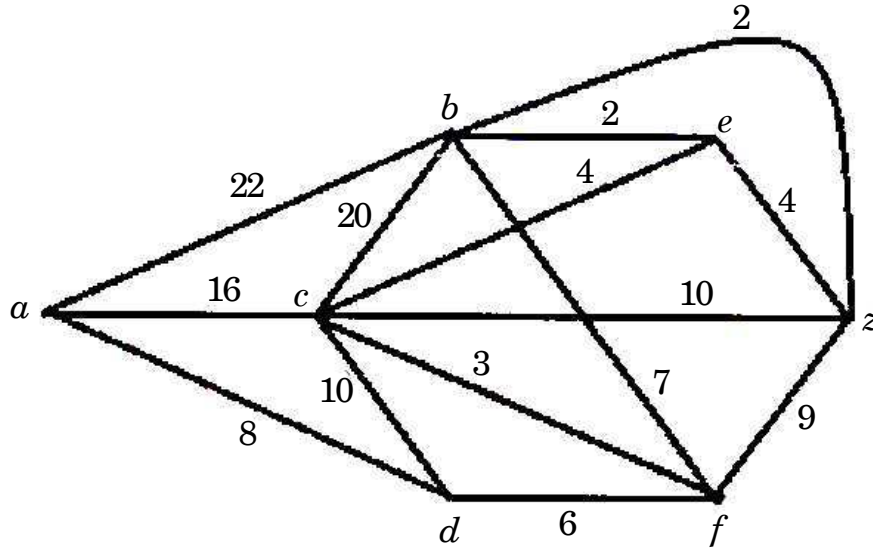
3. (a) Consider an algebraic system $(G, *)$, where G is the set of all non-zero real number and $*$ is a binary operation defined by $a * b = ab/4$. Show that $(G, *)$ is an abelian group. [6]

- (b) What do you understand by factors of a graph ? Find all possible k -Factors of the following graph : [6]

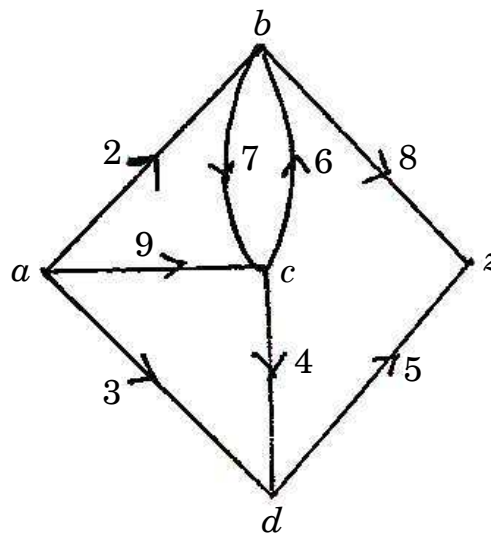


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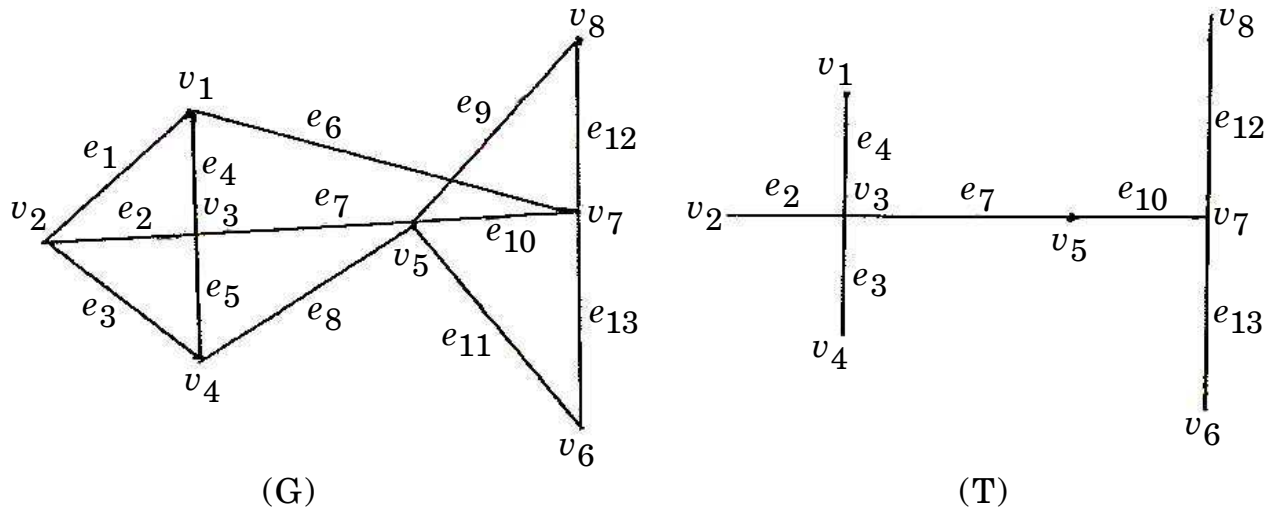
4. (a) Find the degree of $[f(x) + g(x)]$, $[f(x) \cdot g(x)]$ where the polynomials are on the integer (mod 8) and operations are addition and multiplication. You have $f(x) = 2x + 4x^2$, $g(x) = 2 + 6x + 4x^2$. [6]
- (b) Find the shortest path from a to z , using Dijkstra's Algorithm. [6]



5. (a) Determine the maximum flow in the following transport Network. [7]



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



Or

6. (a) Define optimal tree. For the following set of weights, construct optimal binary prefix code. For each weight in the set, give corresponding code words — 8, 9, 12, 14, 16, 19. [7]
- (b) Use the Kruskal's algorithm to find the minimum spanning tree for the graph shown in the figure. [6]

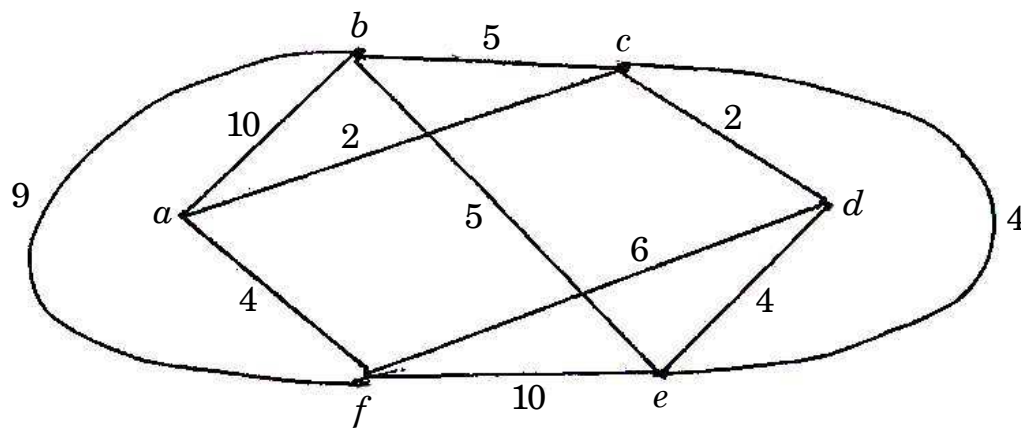


Figure for Kruskal algorithm

7. (a) A single card is drawn from an ordinary deck S of 52 cards.

Find the probability p that : [6]

- (i) The card is a king.
- (ii) The card is a face card (jack, queen or king).
- (iii) The card is a heart.
- (iv) The card is a face.

- (b) Find number of arrangement that can be made out of letters : [7]

- (i) ASSASSINATION
- (ii) GANESHPURI.

Or

8. (a) In a certain college town, 25% of the students failed in mathematics, 15% failed in chemistry, and 10% failed both in mathematics and chemistry. A student is selected at random : [7]

- (i) If he failed in chemistry, what is the probability that he failed in mathematics ?
- (ii) If he failed in mathematics, what is the probability that he failed in chemistry ?

- (iii) What is the probability that he failed in mathematics or chemistry ?
- (iv) What is the probability that he failed neither in mathematics nor in chemistry ?
- (b) 12 persons are made sit around a table. Find the number of ways they can sit such that 2 specific persons are not together. [6]