

Total No. of Questions—8]

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[5152]-171**S.E. (Information Technology) (Second Semester)****EXAMINATION, 2017****DISCRETE STRUCTURES****(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) Prove the statement is true by mathematical induction : [6]

$$n^3 + 2n \text{ is divisible by } 3 \text{ for all } n \geq 1.$$

(b) Find the transitive closure by using Warshall's algorithm for the given relation as : [6]

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

P.T.O.

Or

2. (a) Solve the following recurrence relation : [6]

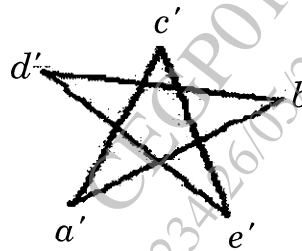
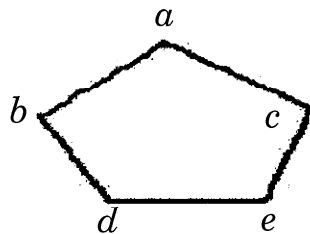
$$a_n - 7a_{n-1} + 10a_{n-2} = 0, a_0 = 0, a_1 = 3.$$

- (b) In a group of 70 cars tested by a garage in a city, 15 had faulty tyres, 20 had faulty brakes and 18 exceed the allowable emission limits. Also 5 cars had faulty tyres and brakes, 6 failed on tyres and emission, 10 failed on brakes and emission and 4 cars were unsatisfactory in all three aspects. How many had no faults in these three checks ? Draw an appropriate Venn diagram. [6]

3. (a) Determine whether the set together with binary operation is a group. If it is group, determine if it is abelian, specify the identity and inverse. [6]

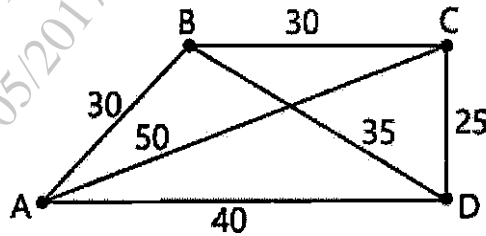
- (i) The set of odd integers under operation of multiplication.
(ii) \mathbb{Q} , the set of all rational numbers under operation of addition.

- (b) Determine graph G and H shown in figure are isomorphic or not ? Justify your answer. [6]

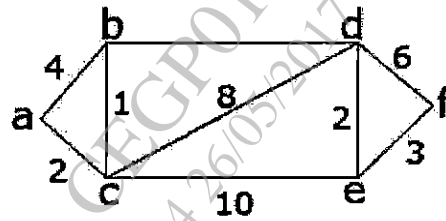


Or

4. (a) Find the Hamiltonian circuit using nearest neighbor method starting in A vertex. [6]



- (b) Find the shortest path using Dijkstra's algorithm for the given graphs. The source node is a and destination node f. [6]

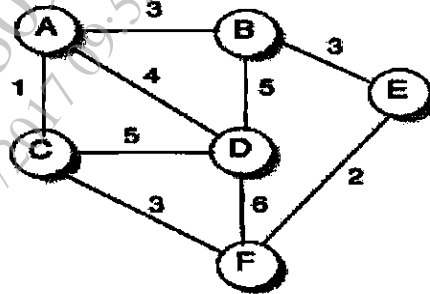


5. (a) Construct an optimal binary tree for the set of weights as : [6]

{8, 9, 10, 11, 13, 15, 22}.

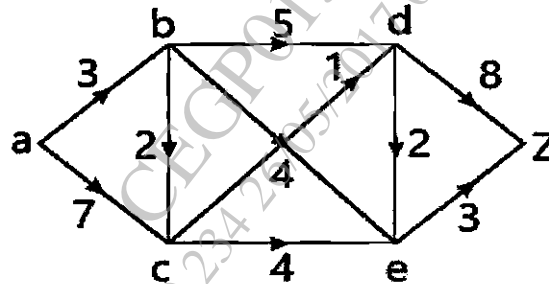
Find the weight of an optimal tree. Also assign the prefix codes and write the code words.

- (b) Find the Minimum spanning tree and weight of it for the given graph using Kruskal's algorithm. [7]

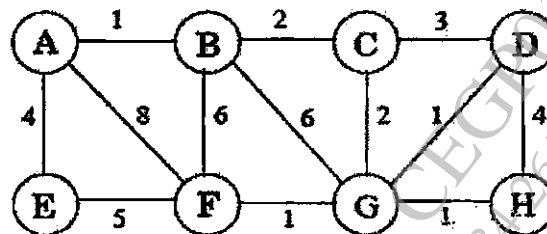


Or

6. (a) Find the maximum flow for the following transport network. [6]



- (b) Find the Minimum spanning tree and weight of it for the given graph using Prim's algorithm. [7]



7. (a) One card is drawn from a deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be : [6]
- (i) a spade
 - (ii) a black card
 - (iii) not a spade.
- (b) How many 3-digit number can be formed using the 2, 3, 4, 5, 7 and 9, if the repetition of digits is not allowed ? [7]
- (i) How many of these numbers is less than 400 ?
 - (ii) How many are even ?
 - (iii) How many are multiples of 5 ?
 - (iv) How many are odd ?
 - (v) How many are multiple of 10 ?

Or

8. (a) Find the number of arrangements that can be made out of the letters : [6]
- (i) INDEPENDENCE
 - (ii) BENZENE.

(b) Three students A, B and C are swimming in the race. A and B have same probability of winning and each is twice as likely to win as C. Find the probability that : [7]

(i) B wins

(ii) C wins

(iii) B or C wins.

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