Total No. of Questions—**8**] [Total No. of Printed Pages—**6**

Seat No.	

[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]

$n^3 + 2n$ is divisible by 3 for all $n >= 1$.

(*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]

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

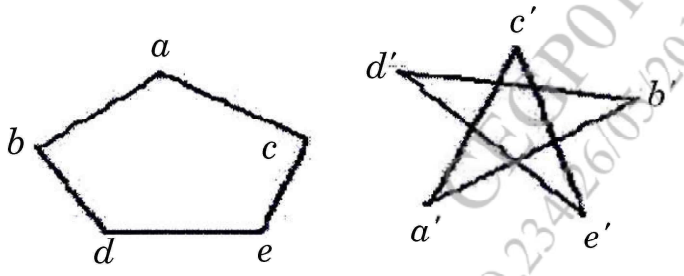
(*b*) In a group of 70 cars tested by a garage in a city, 15 had faulty tyres, 20 had faulty brakes and 18 exceed the allowable emission limits. Also 5 cars had faulty tyres and brakes, 6 failed on tyres and emission, 10 failed on brakes and emission and 4 cars were unsatisfactory in all three aspects. 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.

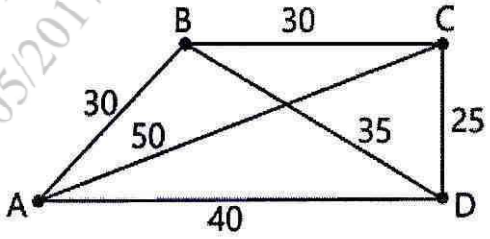
(*ii*) Q, the set of all rational numbers under operation of addition.

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

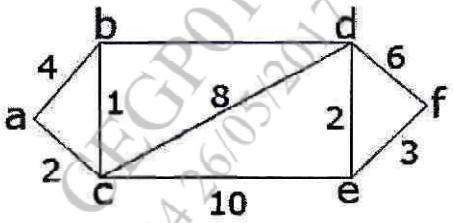


Or

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



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

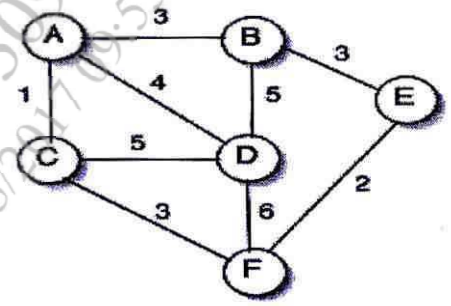


5. (*a*) Construct an optimal binary tree for the set of weights as : [6]

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

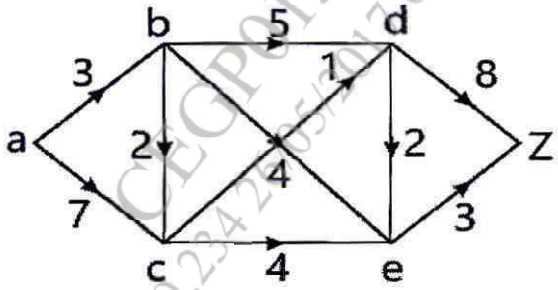
Find the weight of an optimal tree. Also assign the prefix codes and write the code words.

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

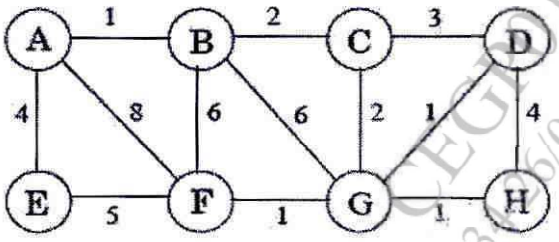


Or

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 repenetition 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.