Total No. of Questions—8]   [Total No. of Printed Pages—4+1

Seat
No.

[4857]-1081

S.E. (I.T.) (First Semester) EXAMINATION, 2015

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*)   Draw Neat diagrams must be drawn wherever necessary.

   (*iii*)   Figures to the right side indicate full marks.

   (*iv*)   Assume suitable data, if necessary.

1.   (*a*)   (*i*)   Show that $(A - B) - C = A - (B \cup C)$ using Venn diagram.   [6]

          (*ii*)   Obtain CNF for the following $\neg (p \vee q) \leftrightarrow (p \wedge q)$

   (*b*)   Draw the Hasse diagram of relation R on A. Let A = {1, 2, 3,

          4, 5} and R = {(1, 1), (2, 1), (2, 2), (3, 1), (3, 2), (3, 3), (4, 1),

          (4, 2), (4, 3), (4, 4), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5)}   [6]

Or

2.   (*a*)   Suppose that 100 out of 120 mathematics students at a college

          take at least one of the languages French, German and Russian.

          Also suppose   [6]

          65 study French   20 study French and German

          45 study German   25 study French and Russian

P.T.O.

42 study Russian   15 study German and Russian

    (*i*)   Find the number of students who study all the three languages.

    (*ii*) Find incorrect number of students in each region of Venn diagram.

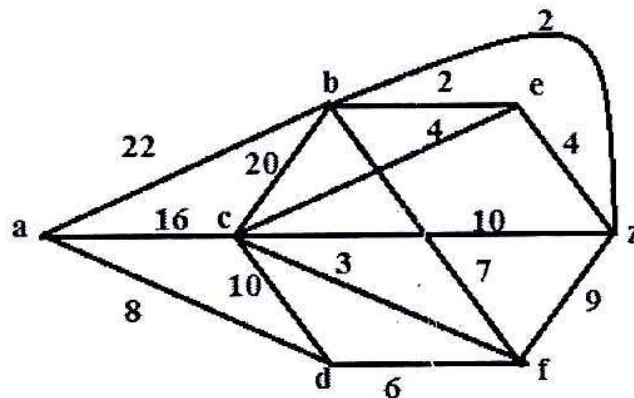   (*iii*) Determine the number K of students who study :

        (*a*)   Exactly one language

        (*b*)   Exactly two languages.

(*b*)   Let A = {*a, b, c, d*} and let R be a relation on A whose relation is R = {(*b, a*), (*c, b*), (*a, d*), (*b, d*), (*c, d*). Find transitive closure using Warahall's method.   [6]

3.   (*a*)   G = {0, 1, 2, 3, 4, 5, 6, 7} and operation is '$+_8$' addition modulo8, then (G, $+_8$) is an abelian group.   [6]

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

Or

4. (*a*) Define the following terms with suitable example : [6]

(*i*) Factor of Graph

(*ii*) Weighted Graph

(*iii*) Graph Coloring

(*iv*) Bipartite Graph

(*b*) Find the minimum distance of an encoding function $e : B^2 \rightarrow B^5$ given as : $e(2, 5)$ [6]

$e(0, 0) = 0\ 0\ 0\ 0\ 0$

$e(0, 1) = 1\ 0\ 0\ 1\ 1$
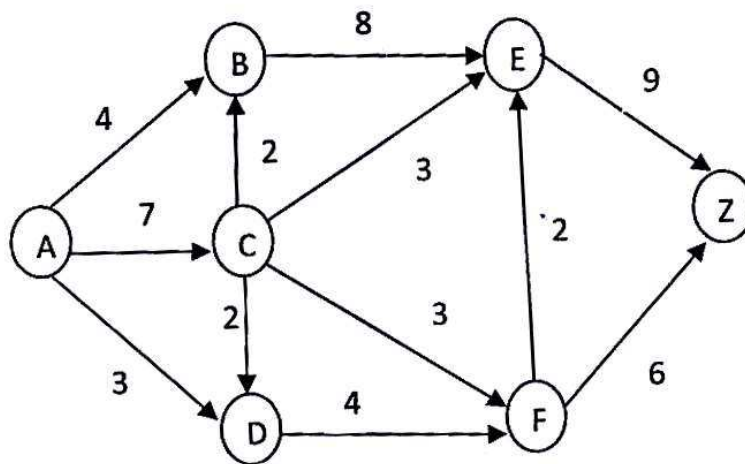
$e(1, 0) = 0\ 1\ 1\ 1\ 0$

$e(1, 1) = 1\ 1\ 1\ 1\ 1$

5. (*a*) Construct a binary tree from given inorder and preorder traversals : [6]
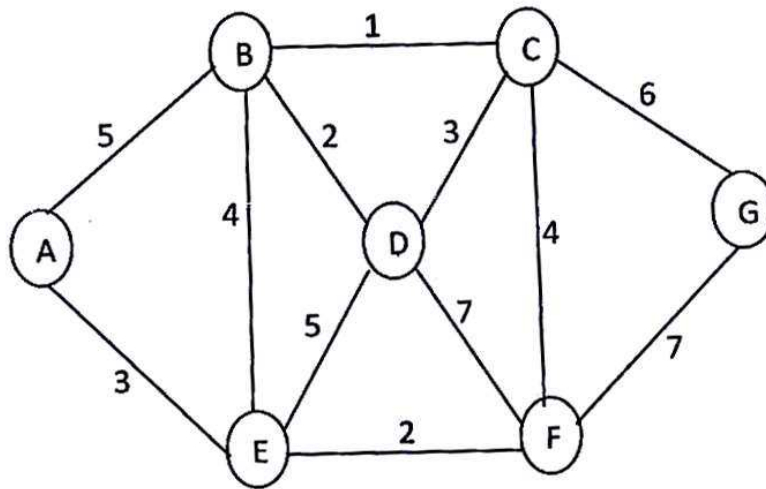
Inorder : A E B D C F G K I H J L

Preorder : F E A D B C G H I K J L

(*b*) Find the maximum flow in the following transport network : [7]

Or

6. (*a*) Determine the minimum spanning tree using Prims algorithm for the following graph : [6]

(*b*) 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]

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

7. (*a*) If 2 cards are drawn from a usual deck of well shuffled pack of 52 cards, what is the probability that 2 aces are drawn ? [3]

(*b*) Two fair dice are rolled, what is the probability that : [4]

(*i*) Sum of the faces is a perfect square.

(*ii*) Sum of the faces is neither 5, 6 or 7.

(c) (i) In how many ways can 10 boys and 5 girls stand in a line so that no two girls are next to each other ? (All boys and girls are distinct)

(ii) In how many ways can 10 boys and 5 girls stand around a circle so that no two girls are next to each other ? (All boys and girls are distinct). [6]

Or

8. (a) A bag contains 5 red, 4 white and 8 blue balls. 4 balls are drawn at random. What is the probability that there is at least one ball of each colour ? [7]

(b) A student must answer 7 out of 10 questions in an examination. [6]

(i) How many choices does the student have ?

(ii) How many choices does she have if she must answer the first three questions ?

(iii) How many choices does she have if she must answer at least three of the first five questions ?