Total No. of Questions—8]   [Total No. of Printed Pages—7

Seat
No.

[5057]-260

S.E. (Computer Engineering) (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 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) Use Mathematical induction to show that :   [4]

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}.$$

(b) Consider the following :   [4]

p : This system is good.

q : This system is cheap.

Write each of the following sentences in symbolic form :

(i)   This system is good and cheap.

(ii)   This system is not good but cheap.

(iii) This is neither good nor cheap.

(iv)   This system is good or cheap.

(c)   Let

$$A = \{a, \ b, \ c, \ d\}, \ \pi = \{\{a, \ b\}, \ \{c\}, \ \{d\}\}.$$

Find the equivalence relation induced by π and construct its diagraph.   [4]

Or

2.   (a)   Let

$$A = \{\phi, b\}$$

Construct the following sets :   [4]

(i) $A - \phi$

(ii) $\{\phi\} - A$

(iii) $A \cup P (A)$

(iv) $A \cap P (A)$ where P is a power set.

(b)   Find the transitive closure of R by Warshall's algorithm, [4]

where $a = \{1, \ 2, \ 3, \ 4, \ 5, \ 6\}$ and

$$R = \{(X, \ Y) \mid |X - Y| = 2\}.$$

(c) Among 100 students, 32 study Mathematics, 20 study Physics, 45 study Biology, 15 study Mathematics and Biology, 7 study Mathematics and Physics, 10 study Physics and Biology, 30 do not study any of the three subjects : **[4]**

(*i*) Find the number of students studying all the three subjects

(*ii*) Find the number of students studying exactly one of the three subjects.

3. *(a)* Define : **[5]**

(*i*) Ring

(*ii*) Ring Homomorphism

(*iii*) Ring Isomorphism
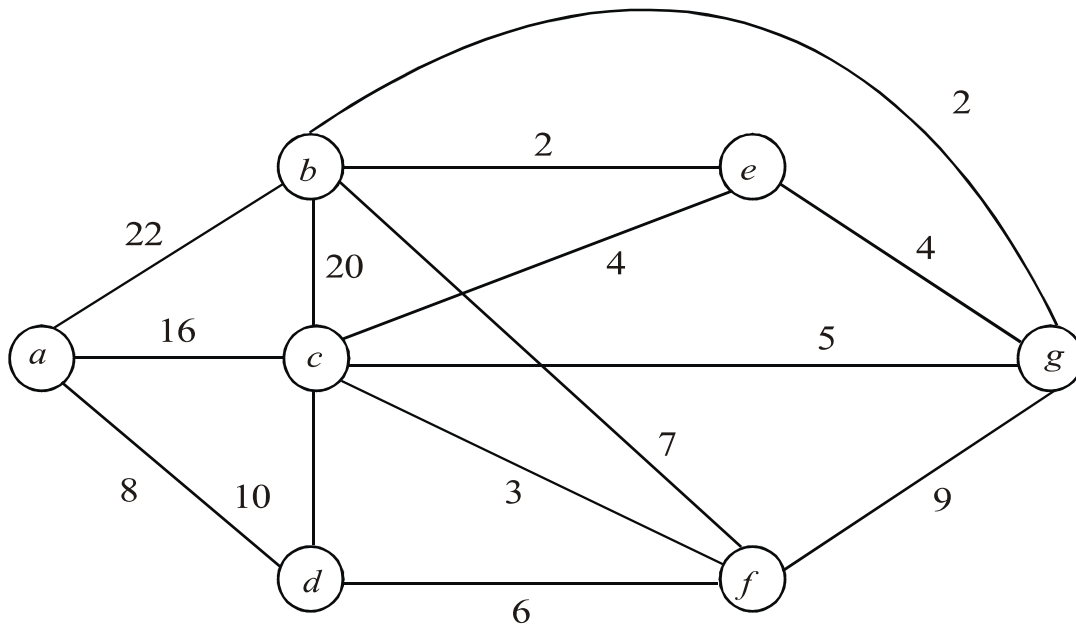
(*iv*) Integral domain

(*v*) Semi-Group.

(b) Show that if a, b are arbitrary elements of group A, then : **[4]**

$(ab^2) = a^2b^2$ if and only if G is abelian.

(c) Draw a complete bipartite graph on 2 and 4 vertices $K_{2,4}$ and 2 and 3 vertices $K_{2,3}$. **[3]**

Or

4. (*a*) Find the shortest path between the vertices *a* to *z* in the graph given below by using Dijkstra's algorithm. [6]

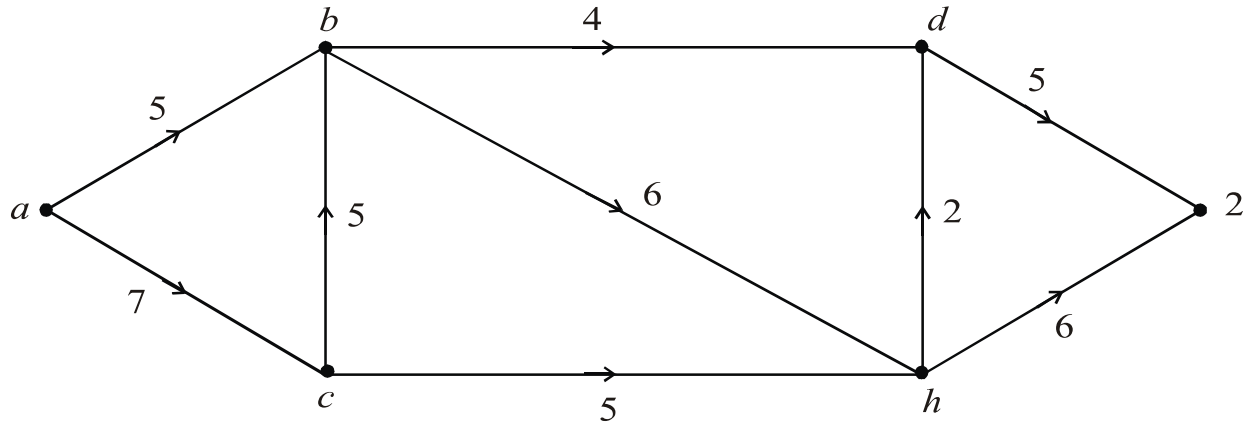(*b*) With reference to the graph theory define the following terms : [3]
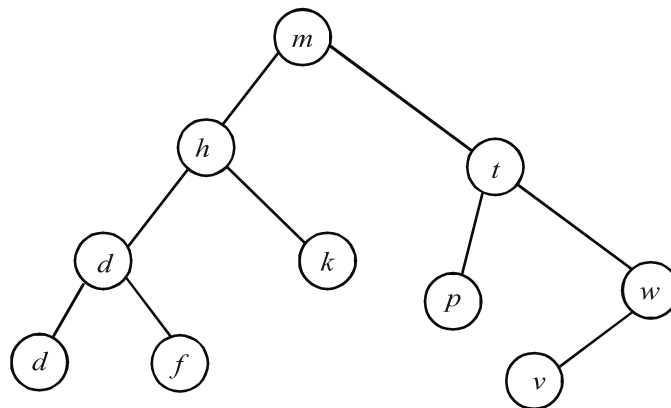
(*i*) Regular Graph

(*ii*) Acyclic Graph

(*iii*) Multi Graph.

(*c*) Consider the group (Z, +). Let $H = (3n : n \in z)$. Show that H is a subgroup of z.s. [3]

5.   (*a*)   Find the maximum flow in the transport network using labeling procedure. Determine the corresponding minimum cut.   [8]
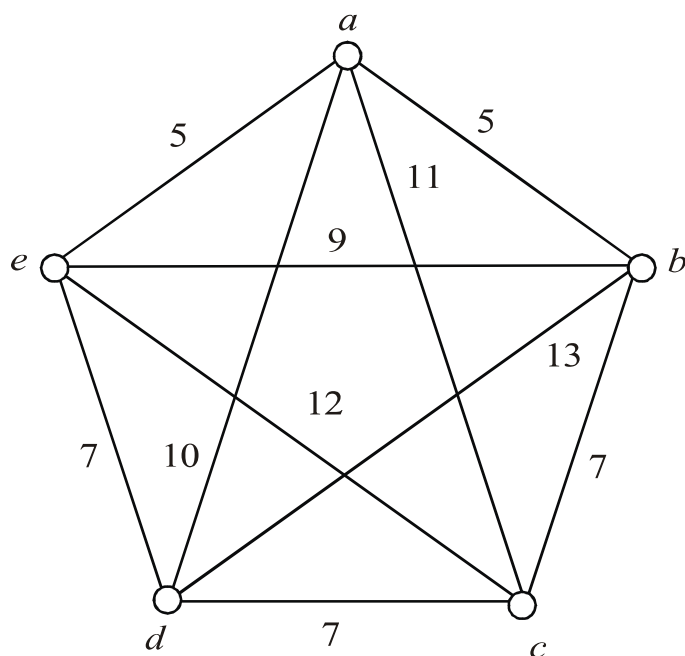

(*b*)   Define binary tree traversal and find preorder, postorder and inorder traversals for the following binary tree.   [5]

Or

6.   (*a*)   Define Spanning Multigraph and Acyclic Graph. Use Kruskal's Algorithm to find minimum spanning tree for the graph as shown in figure.   [8]

(b) Construct the labeled tree of the following algebraic expression : [5]

A + B * C + D * E

7. (a) Suppose license plate contains 3 English letters followed by 4 digits : [7]

(i) How many different license plates can be manufactured if repetition of letters and digits are allowed ?

(ii) How many plates are possible if only the letters are repeated ?

(iii) How many plates are possible if only the digits are repeated ?

(*b*) Mohan has three shares in a lottery in which there are 3 prizes and 6 blanks. Rohan has one share in a lottery in which there is 1 prize and 2 blanks. Show that Mohan's chance of winning a prize of Rohan's chance is the ratio 16 : 7. [6]

Or

8. (*a*) In how many ways can seven men and seven women sit down at a round table in such a way that no two men sit next to each other ? [7]

(*b*) A bag contains 3 red and 5 black balls and a second bag contains 6 red and 4 black balls. A ball is drawn from each bag. Find the probability that : [6]

(*i*) both are red

(*ii*) both are black

(*iii*) 1 is red and 1 is black.