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

Seat
No.

[5252]-571

S.E. (Infor. Tech.) (First Semester) EXAMINATION, 2017
DISCRETE STRUCTURES
(2015 PATTRN)

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) Assume suitable data, if necessary.

1. *(a)* Suppose that a department contains 10 men and 15 women. How many ways are there to form a committee with six members if it must have the same number of men and women ? [6]

(b) Show that $\neg (p \leftrightarrow q)$ and $p \leftrightarrow \neg q$ are logically equivalent. [6]

Or

2. *(a)* Suppose that Gopal selects a ball by first picking one of two boxes at random and then selecting a ball from this box at random. The first box contains two white balls and three blue balls, and the second box contains four white balls and one blue ball. What is the probability that Gopal picked a ball from the first box if he has selected a blue ball ? [6]

(b) Prove that $1^1 + 2^2 + \ldots + n^2 = n (n + 1) (2n + 1)/6$ for the positive integer n using mathematical induction. [6]

P.T.O.

3. (*a*) Use Warshall's algorithm to find transitive closure of the following relation on the set {1, 2, 3, 4},

R = {(1, 2,), (1, 3), (1, 4), (2, 3), (2, 4), (3, 4)} [6]

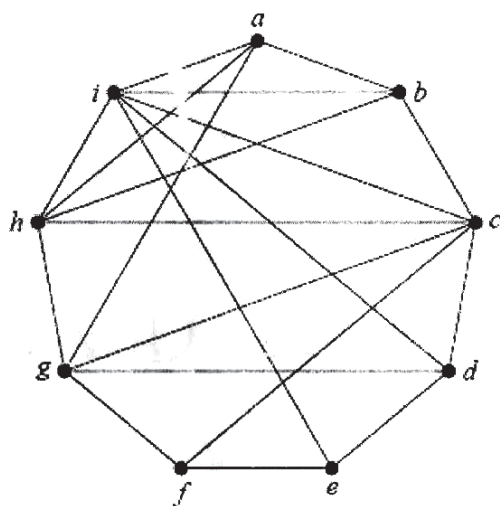(*b*) Draw the graph and its equivalent Hasse diagram for divisibility on the set : [6]

{1, 2, 3, 6, 12, 24, 36, 48}
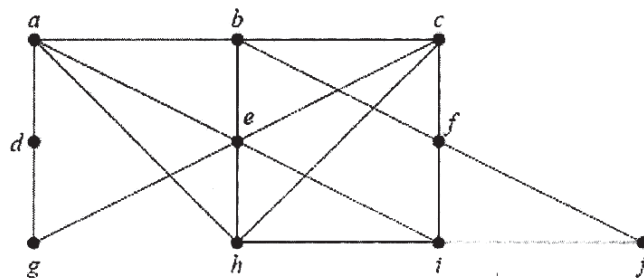
Or

4. (*a*) Find inverse function of the function $y = 1 - x^2$. [6]

(*b*) Determine the chromatic number of following graphs : [6]

(*i*)

(*ii*)

5. (*a*) Suppose 1000 people enter a chess tournament. Use a rooted tree model of the tournament to determine how many games must be played to determine a champion, if a player is eliminated after one loss and games are played until only one entrant has not lost. (Assume there are no ties). [7]

(*b*) How many leaves does a full 3-ary tree with 40 vertices have? Illustrate with suitable diagram. [6]

Or

6. (*a*) What is prefix-free code ? Which of these codes are prefix-free codes ? [7]

(*i*) a : 0, e : 1, t : 01, s : 001

(*ii*) a : 101, e : 11, t : 001, s : 011, n : 010

(*b*) Determine the order in which preorder, inorder and postorder traversal visit the vertices in given ordered tree. [6]
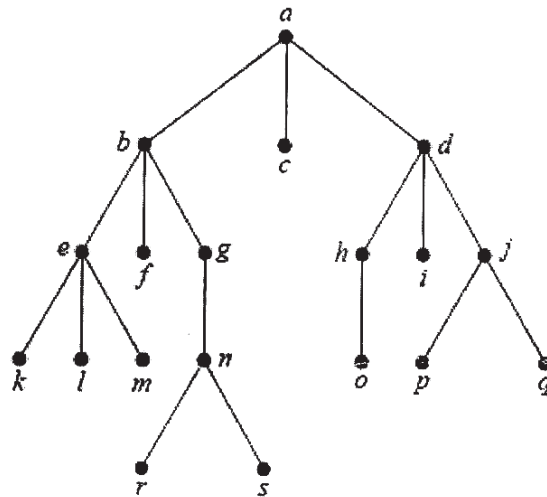
7. (a) Find the number of code generated by given check matrix H. Also find all codeword generated. [7]

$$H = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

(b) Define the following with suitable example : [6]
(i) Group
(ii) Monoid;
(iii) Abelian group.

Or

8. (a) Let R = {0º, 60º, 120º, 180º, 240º, 300º} and * = binary operation, so that for a and b in R, $a * b$ is overall angular rotation corresponding to successive rotations by a and then by b. Show that (R, *) is a Group. [7]

(b) G = {0, 1, 2, 3, 4, 5, 6, 7) and operation is '+8' addition modulo 8, then (G, +8) is an abelian group. [6]