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

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[4857]-1071

S.E. (Computer) (First Semester) EXAMINATION, 2015
DISCRETE STRUCTURES
(2012 PATTERN)

Time : Two Hours   **Maximum Marks : 50**

N.B. :— (i) Neat diagrams must be drawn wherever necessary.

(ii) Figures to the right indicate full marks.

(iii) Assume suitable data, if necessary.

1. (a) Use mathematical induction to show that $n^2 - 4n^2$ is divisible by 3 for all $n \geq 2$. [4]

(b) Negate each of the statement : [4]

(i) $\forall x, |x| = x$.

(ii) $\exists x, x^2 = x$.

(iii) If there is a riot, then someone is killed.

(iv) It is day light and all the people are arisen.

(c) Let

R = {(a, d), (b, a), (b, d), (c, b), (c, d), (d, c)}

use Warshall's algorithm to find the matrix of transitive closure where A = {a, b, c, d}. [5]

Or

2. (a) Let A, B, C be sets. Under what conditions the following statements are true ? [2]

(i) (A – B) ∪ (A – C) = A

(ii) (A – B) ∪ (A – C) = ϕ.

P.T.O.

(b)   It was found that in the first year computer science class of 80 students, 50 knew COBOL, 55 'C' and 46 PASCAL. It was also known that 37 knew 'C and COBOL, 28 'C' and PASCAL, and 25 PASCAL and COBOL. 7 students however knew none of the language :   [6]

(i)   How many knew all the three languages ?

(ii)   How many knew exactly two languages ?

(iii)   How many knew exactly one languages ?

(c)   Let

A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 18, 24}

be ordered by the relation x divides y. Show that the relation is partial ordering and draw the Hasse diagram.   [5]

3.   (a)   What is Hamming Distance ? Give parity check matrix :

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

Find minimum distance of code generated by H. How many errors can it detect and correct.   [6]

(b)   Use Dijkstra's algorithm to find the shortest path between a and z for Fig. A.   [6]
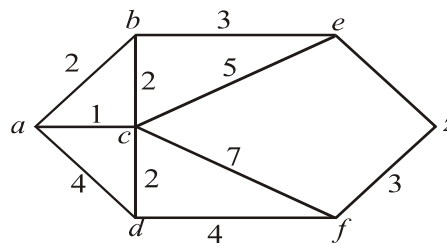

Fig. A

Or

4. (*a*) Define the following terms with suitable example : [2]

  (*i*) Homomorphism of Group

  (*ii*) Automorphism of Group.

 (*b*) Show that (G/N, *) is a group. [4]

 (*c*) Use nearest neighbour method to find the Hamiltonian circuit starting from *a* in the following graph Fig. B. Find its weight. [6]
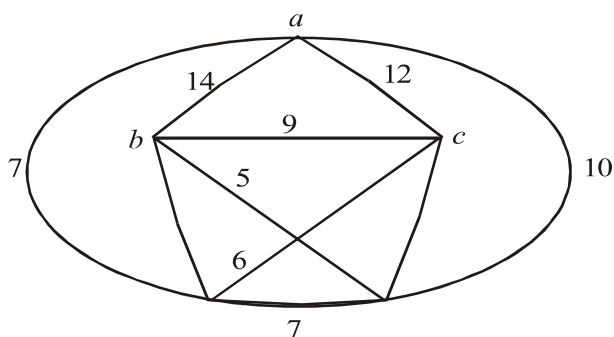

Fig B

5. (*a*) Define the following terms with reference to tree with example : [6]

  (*i*) Eccentricity of a vertex

  (*ii*) Cut points

  (*iii*) Level and Height of a tree.

 (*b*) A secondary storage media contains information in files with different formats. The frequency of different types of files is as follows :

 Exe(20), bin(75), bat(20), jpeg(85), dat(51), doc(32), sys(26), c(19), cpp(25), bmp(30), avi(24), prj(29), Ist(35), zip(37).

 Construct the Huffman code for this. [7]

Or

6. (*a*) Obtain the minimum spanning tree using Kruskal algorithm for the following graph. Obtain the total cost of minimum spanning tree. [7]
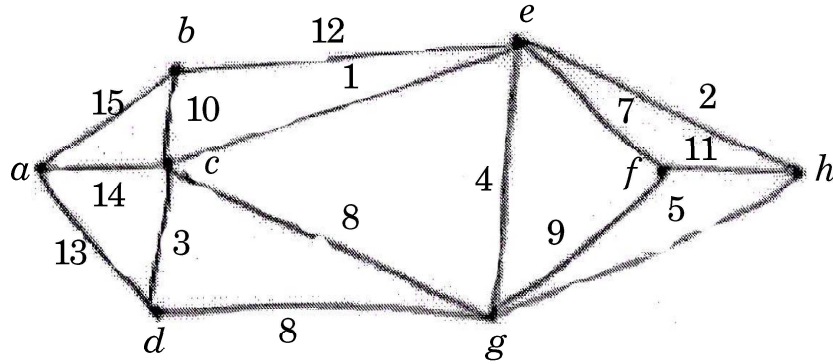
(*b*) Find the fundamental system of cut-set for the graph G shown below with respect to the spanning tree T. [6]

(*a*)   (*b*)
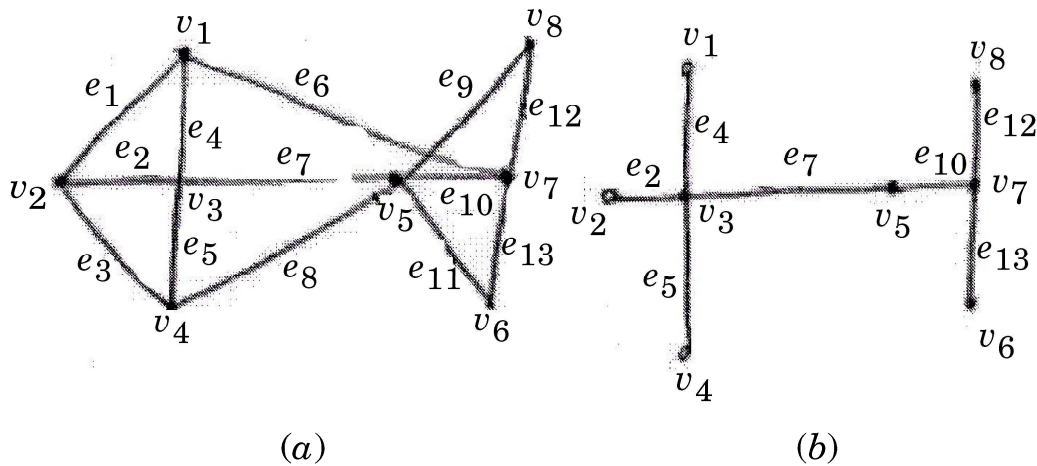
7. (*a*) Suppose license plate contains 3 english letters followed by 4 digits : [6]

(*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*) Out of 4 officers and 10 clerks, a committee of 2 officers and 3 clerks is to be formed. In how many ways committee can be done if : [6]

(*i*) Any officer and any clerk can be included

(*ii*) A particular clerk must be in committee

(*iii*) A particular officer cannot be in committee.

Or

8. (*a*) A student is to answer 10 out of 13 question in an exam : [6]

(*i*) How many choices has he, if he must answer the first or second questions but not both ?

(*ii*) How many choices has he, if he must answer exactly three out of first five questions.

(*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 : [6]

(*i*) B wins

(*ii*) C wins

(*iii*) B or C wins.