

Total No. of Questions—8]

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**[4757]-1080**

**S.E. (Computer) (First Semester) EXAMINATION, 2015**

**DISCRETE STRUCTURE**

**(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) 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. [4]

(i) How many knew all the three languages ?

(ii) How many knew exactly two languages ?

(iii) How many knew exactly one language ?

P.T.O.

(b) Let  $n$  be a positive integer  $S_n$ , be the set of all divisors of  $n$ .  
Let  $D$  denote the relation of 'division'. Draw the diagrams of  
lattices for : [4]

(i)  $n = 24$

(ii)  $n = 30$

(iii)  $n = 6$ .

(c) 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.

*Or*

2. (a) Find the transitive closure of the relation  $R$  on : [4]

$A = \{1, 2, 3, 4\}$  defined by

$R = \{(1, 2), (1, 3), (1, 4), (2, 1), (2, 3), (3, 4), (3, 2), (4, 2), (4, 3)\}$

(b) Prove by mathematical induction that for :  $n \geq 1$  : [4]

$$1.1! + 2.2! + 3.3! + \dots + n.n! = (n + 1)! - 1$$

(c) Let  $f(x) = x + 2$ ,  $g(x) = x - 2$  [4]

$h(x) = 3x$  for  $x \in \mathbb{R}$  where  $\mathbb{R}$  is the set of real number,

find :

(i)  $g \circ f$

(ii)  $f \circ g$

(iii)  $f \circ f$

(iv)  $h \circ g$

(v)  $g \circ g$

(vi)  $f \circ h$

(vii)  $h \circ f$

(viii)  $f \circ h \circ g$

3. (a) Show that in a connected planar graph with 6 vertices and 12 edges, each of the regions is bounded by 3 edges : [5]

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

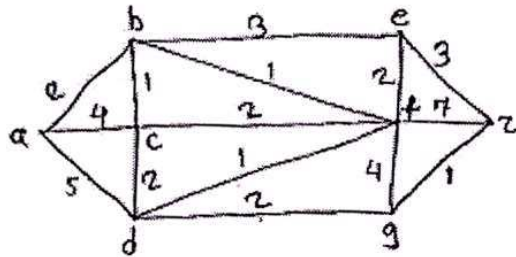
(c) Explain the terms : [4]

(i) Homomorphism of Group

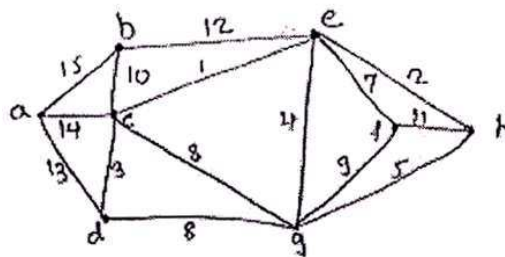
(ii) Automorphism of Group.

Or

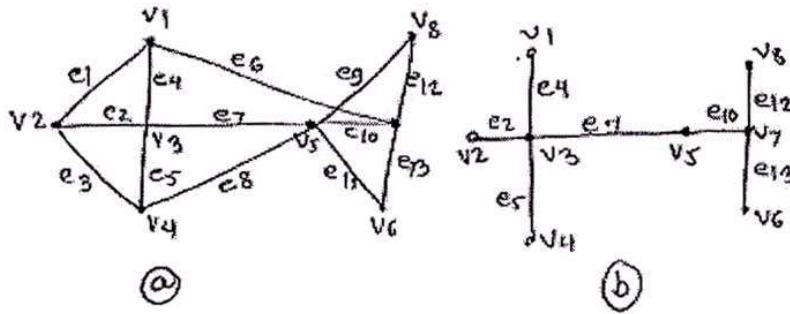
4. (a) Find the shortest path between  $a-z$  for the given graph : using Dijkstra's algorithm. [6]



- (b) Show that  $R = \{a + b; b \mid\}$  for the operation  $+$ ,  $*$  is an integral domain but not a field. [5]
- (c) Explain the term Eulerian path and Eulerian circuit with example. [2]
5. (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. [5]



Or

6. (a) 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), 1st(35), zip(37). Construct the Huffman code of this. [6]
- (b) Explain : [6]
- Eccentricity of a vertex
  - Cut points
  - Level and height of a tree.

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) 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 questions 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 : [7]

(i) B wins

(ii) C wins

(iii) B or C wins.