

Total No. of Questions—8]

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[5352]-571

**S.E. (Information Technology) (First Semester)**

**EXAMINATION, 2018**

**DISCRETE STRUCTURES**

**(2015 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

**N.B. :—** (i) Solve question Nos. Q. 1 or Q. 2, Q. 3 or Q. 4,  
Q. 5 or Q. 6, Q. 7 or Q. 8.

(ii) Neat diagram must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Assume suitable data if necessary.

1. (a) Find the smallest number of people you need to choose at random so that the probability that at least two of them were both born on April 1 exceeds  $\frac{1}{2}$ .

Assume number of days in year as 366 days. [6]

- (b) Show that each of these conditional statements is a tautology by using truth tables : [6]

(i)  $(p \wedge q) \rightarrow p$

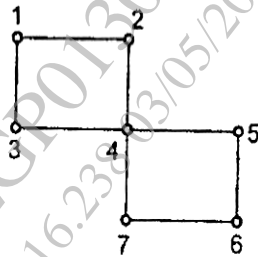
(ii)  $p \rightarrow (p \vee q).$

P.T.O.

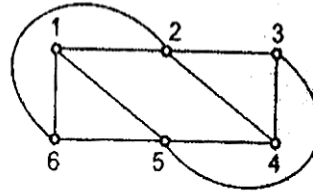
Or

2. (a) A club has 25 members : [6]
- (i) How many ways are there to choose four members of the club to serve on an executive committee ?
- (ii) How many ways are there to choose a president, vice president, secretary, and treasurer of the club, where no person can hold more than one office ?
- (b) There are 2504 computer science students at a school. Of these, 1876 have taken a course in Java, 999 have taken a course in Linux, and 345 have taken a course in C. Further, 876 have taken courses in both Java and Linux, 231 have taken courses in both Linux and C, and 290 have taken courses in both Java and C. If 189 of these students have taken courses in Linux, Java, and C, how many of these 2504 students have not taken a course in any of these three programming languages ? [6]
3. (a) Draw the graph and its equivalent Hasse diagram for divisibility on the set : [6]
- $\{1, 2, 3, 6, 12, 24, 36, 48\}$ .
- (b) State the theorems for presence of Euler path and circuit in a graph. Justify whether the graphs contain the following properties. If yes, write the path and circuit : [6]
- (i) Euler path
- (ii) Euler circuit

- (iii) Hamiltonian path
- (iv) Hamiltonian circuit.



$G_1$

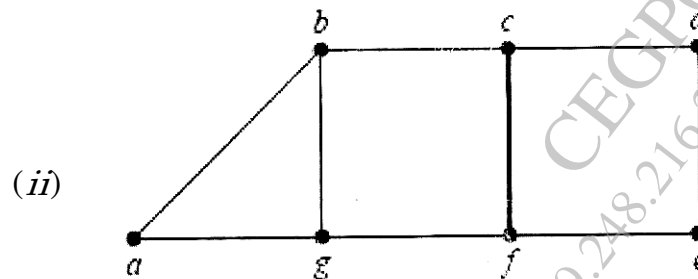
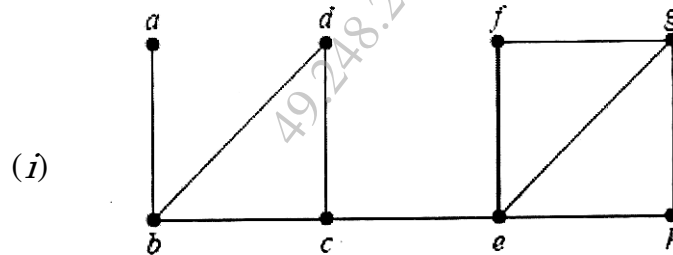


$G_2$

4. (a) Use Warshall's algorithm to find transitive closure of the following relation on the set  $\{1, 2, 3, 4\}$ , [6]

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

- (b) Find minimum cut set and value of vertex connectivity of the following graphs. [6]





7. (a) What is abelian group ? Show that  $(\mathbb{Z}_6, +)$  is an Abelian Group ? [7]

- (b) Find the hamming distance between code words of :

$$C = \{(0000), (0101), (1011), (0111)\}$$

Rewrite the message by adding even parity check bit and odd parity check bit. [6]

*Or*

8. (a) Let  $R = \{0^\circ, 60^\circ, 120^\circ, 180^\circ, 240^\circ, 300^\circ\}$  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) Let  $G = \{\text{even}, \text{odd}\}$  and binary operation  $\oplus$  be defined as : [6]

$\oplus$	even	odd
even	even	odd
odd	odd	even

Show that  $(G, \oplus)$  is a group.