

**People's Education Society's**  
**Dr. Ambedkar College of Commerce and Economics, Wadala, Mumbai – 400 031**  
**S.Y.B.Sc (IT) Third Semester Examination October 2015**  
**Sub: Logic and Discrete Mathematics**

**Date: 28/10/2015**

**Marks: 75**

**Time: 8.00 to 10.30 a.m.**

**Notes: All questions are compulsory with internal options.**

**1. Solve the Following questions( Any Two) [ 10 Marks]**

- a. How many numbers in  $N_{100}$  are divisible by 6 or 7?
- b. Out of 1200 students , 582 took Economics , 627 took English, 543 took Mathematics, 217 took both Economics and English, 307 took both Economics and Mathematics, 250 took both Mathematics and English and 222 took all three subjects. How many took none of the three?
- c. Prove using Mathematical Induction  $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$
- d. Find DNF of  $(p \rightarrow r) \wedge (q \rightarrow r)$ .

**2. Solve the Following questions( Any Two) [ 10 Marks]**

- a. Determine Given matrix is Equivalence Relation for  $A = \{a, b, c\}$

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

- b. Relation R & S are given below  
 $R = \{(1,1), (3,1), (3,4), (4,2), (4,3)\}$   
 $S = \{(1,3), (2,1), (3,1), (3,2), (4,4)\}$   
 Find: (A) RoS (B) SoR (C) RoR (D) SoS
- c. Use Warshall's algorithm to find the transitive closure of relation on  $A = \{1, 2, 3, 4\}$  and

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

- d. Let  $A = \{a, b, c, d\}$  and Relation Matrix is given below. Construct Linked list with Vert, Tail, Head & Next

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

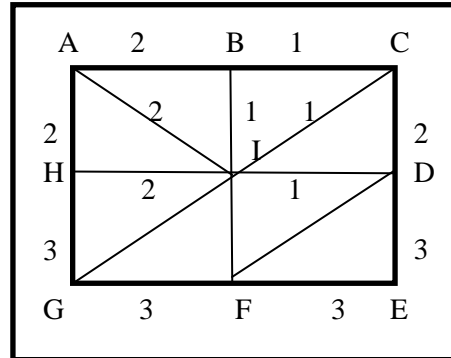
**3. Solve the Following questions( Any Two) [ 10 Marks]**

- a. Determine function is One-to-one & onto.  
 $f(a) = |a|$       $A = R$ ,      $B = \{x \mid x \in R \text{ and } x \geq 0\}$ ;
- b.  $F(x) = \frac{6x + 4}{2x - 5}$  Find Inverse of F(X)
- c. Evaluate (A)  $\log_2 16$  (B)  $\log_{10} 0.01$
- d. How many minimum People are required to guarantee that at least 2 of them born at exactly the same time with hour, Minute and Seconds using Pigeonhole Principle.

**4. Solve the Following questions( Any Two)**

[ 10 Marks]

- Construct Tree for Expression:  $3-(X-(6*(4/(2-3))))$
- Evaluate Expressions: (A)  $+-^3 2^2 3 / 8 - 4 2$  (B)  $7 2 3 * - 4 ^ 9 3 / +$
- Explain Euler & Hamiltonian Graphs with examples.
- Find Minimum Spanning Tree.



**5. Solve the Following questions( Any Two)**

[ 10 Marks]

- Check the binary operation is Commutative & Associative,  $a * b = a + 2b + 1$  for  $N$ .
- Check the binary operation is Semigroup, Monoid, Group.  
 $Z$ , where  $a * b = a + b - ab$
- Show that  $(G, +6)$  is cyclic group where  $G = \{0, 1, 2, 3, 4, 5\}$
- Check which type of ring is:  $(N, +, \times)$  where  $N$  is natural Number.

**6. Solve the Following questions( Any Two)**

[ 10 Marks]

- Find generating function of Sequence : 2, 2, 2, 2, 2, 2.
- Solve recurrence relation using backtracking technique.  
 $C_n = C_{n-1} - 2, C_1 = 0$
- Solve recurrence relation using Characteristics root method  
 $A_n = -3A_{n-1} - 2A_{n-2}, A_1 = -2, A_2 = 4$
- Solve the recurrence relation using method of Generating Function

$$A_n = 3A_{n-1} - 2A_{n-2}, A_0 = 4, A_1 = 6$$

**7. Solve the Following questions( Any Three)**

[ 15 Marks]

- Write Negation of (a)  $(\sim P \wedge q) \vee \sim r$  (b)  $P \leftrightarrow \sim q$
- Define Poset & its Properties. Write Steps to Obtain Hasse Diagram.
- $F(x) = 4x + 5$   $G(x) = 6x + 4$  find Compositions: (A)  $F \circ G$  (B)  $G \circ F$
- Draw Binary Tree for Prefix Codes:  
 $e \rightarrow 0, a \rightarrow 10, t \rightarrow 110, n \rightarrow 1110, s \rightarrow 1111$
- Encoding function  $e$ : defined as below & Find Minimum distance  
 $e(00) = 000000$   $e(01) = 011110$   $e(10) = 101010$
- Find generating function of Sequence: 1, 0, 1, 1, 1, 1, .....