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**TMA-301**

**B. Tech. (CS/IT) (Third Semester)**  
**End Semester EXAMINATION, 2017**  
**DISCRETE MATHEMATICS**

*Time : Three Hours ] [ Maximum Marks : 100*

**Note :** (i) This question paper contains five questions.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Total marks assigned to each question are twenty.

1. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) State and prove the distributive law of disjunction over conjunction using truth table.

(b) In a survey of 300 persons it is found that 150 persons like the product A, 80 persons like the product B and 60 persons like the

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product C. 70 persons like A and B, 40 persons like A and C, 100 persons like A only. Determine the number of persons who like :

- (i) All the three products
- (ii) A and B only but not C.
- (c) (i) Define the identity function and constant function with example of each.
- (ii) If  $f(x) = x^2$ ,  $g(x) = (x+1)$ ,  $h(x) = (x-1)$ , find  $g \circ f \circ h$ .

2. Attempt any two parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) If set  $A = \{1, 2, 3, 4, 5, 6\}$ , write a relation R on A following the rule  $r = (a-b)^2 \in A$ . Hence examine which of the following property are satisfied by R :

- (i) Reflexive
- (ii) Symmetric
- (iii) Antisymmetric
- (iv) Transitive

(b) How many three digit even numbers can be formed from the digits 0 to 9 ? If :

- (i) Repetition of digits is not allowed
- (ii) Repetition of digits is allowed

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(c) Examine whether  $G = \{0, 1, 2, 3, 4, 5, 6, 7\}$  is an Abelian group under addition modulo 8.

3. Attempt any two parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) If I study then I will not fail in examination. If I do not play basketball then I will study, but I failed in examination. Check the validity of the above argument.

(b) Prove by mathematical induction that  $2^n < n!$  for all  $n \geq 4$ .

(c) State and prove Lagrange's Theorem for groups.

4. Attempt any two parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Draw the Hasse diagram for the Poset  $A = \{1, 2, 3, 4, 12\}$  under the rule  $r = "a \text{ divides } b"$  when  $a \leq b$ .

(b) Solve the following recurrence relation :

$$a_r + a_{r-1} = 5r \times 2^r$$

(c) Define Lattice and prove that every sublattice of a distributive lattice is also a distributive lattice.

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5. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Explain a Ring with all its properties.

(b) Define Homomorphism and Isomorphism of groups with an example of each.

(c) Explain cyclic group. Determine whether  $G = \{1, 2, 3, 4\}$  is a cyclic group under multiplication modulo 5.