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## TMA-301

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

*Time : 1:30 Hours ]*

*[ Maximum Marks : 50*

**Note :** (i) This question paper contains two Sections.  
(ii) Both Sections are compulsory.

### Section—A

1. Fill in the blanks/True-False : (1×5=5 Marks)
  - (a)  $3x - 4y$  is statement. (True/False)
  - (b)  $p \leftrightarrow (\sim p \vee \sim q)$  is a tautology. (True/False)
  - (c) 5 different rings can be worn in 4 fingers in ..... ways.
  - (d) A set with one element is called .....
  - (e) For a set A,  $A \cap \phi = \dots\dots\dots$
2. Attempt any *five* parts : (3×5=15 Marks)
  - (a) Determine the number of ways in which 5 Programmers and 3 Software Engineers can sit around a table so that no two Software Engineers are together.

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- (b) Explain the laws of inference.
- (c) Define quantifiers with example.
- (d) Explain the sum and product rule of counting with example.
- (e) Find the permutations of the letters of the word "ARRANGE" so that two R's are never together.
- (f) Out of 10 professors and 20 students, a committee of 2 professors and 3 students is to be formed. Find the total number of ways if one particular professor and one particular student is not to be included.

**Section—B**

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)
  - (a) Determine whether the following statement is a contradiction :
 
$$[p \rightarrow (q \wedge \sim r)] \leftrightarrow [r \rightarrow p]$$
  - (b) Prove by mathematical induction that :
 
$$1.2 + 2.2^2 + 3.2^3 + \dots + n.2^n = (n-1)2^{n+1} + 2$$
  - (c) Explain the difference between permutation and combination with example.
4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)
  - (a) Examine the validity of the following argument :

$$p \rightarrow q, \sim r \vee q, r \leftrightarrow \sim p, \sim p$$

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- (b) If the set  $A = [2, 3, 5, 8, 10]$  and Set  $B = \{4, 5, 6, 8, 1\}$  find the symmetric difference  $A$  and  $B$ .
  - (c) State and prove the Associative law of sets for union using the algebra of sets.
5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)
    - (a) In a survey of usage of three toothpastes namely A, B and C, it is found that 60 persons like A, 55 like B and 40 like C. Also 10 like A and B, 15 like A and C, 35 like B and C and 10 like all the three. Find out the number of persons included in the survey.
    - (b) Prove by mathematical induction that  $(n^5 - n)$  is divisible by 5.
    - (c) Using the digits 0, 1, 2, 3, 4, 5, 6. How many different three digits odd numbers can be formed if repetition of digits is not allowed.

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