

Printed pages: 02

Sub Code: NCS302

Paper Id: 

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**B.Tech.**  
**(SEM III) THEORY EXAMINATION 2017-18**  
**DISCRETE STRUCTURE AND GRAPH THEORY**

Time: 3 Hours

Total Marks: 100

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

- 1. Attempt all questions in brief. 2 x10 = 20**
- a. Define Multiset with example.
  - b. Write the formula for Hypothetical syllogism and Modus ponens.
  - c. Define the equivalence relation with conditions.
  - d. Simplify the following Boolean function using k-map:  $f(x, y, z) = \sum (0, 2, 3, 7)$ .
  - e. How many binary relations are possible with a given Set A with Cardinality n?
  - f. Find the generating function for the sequence  $1, a, a^2, a^3, a^4, \dots$
  - g. Define Group with suitable examples.
  - h. Define Binary Tree traversal with example.
  - i. Draw the hasse diagram for  $(D_{24}, /)$ .
  - j. What is order of graph explain with an example.

**SECTION B**

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Let  $A = \{1, 2\}$  and  $B = \{a, b\}$  find all functions  $f: A \rightarrow B$  and for each such functions determine whether it is one-to-one, onto, both or neither with explanations.
  - b. Let  $G = \{1, -1, i, -i\}$  with the binary operation multiplication be an algebraic structure, where  $i = \sqrt{-1}$  then determine whether G is an Abelian group. Also if G is cyclic Group, then determine the generator of G.
  - c. Define Tautology and Show that  $[p \rightarrow (q \rightarrow r)] \rightarrow [(p \rightarrow q) \rightarrow (p \rightarrow r)]$  is a tautology using Truth table.
  - d. Define Pigeonhole Principle. 15 students wrote a distinction x may 13 errors each of the other student made less than that no of errors. Prove that at least two students made equal no of errors.
  - e. Define coloring of Graph. And also explain the Chromatic number of a Graph. What is the chromatic no. for bipartite graph  $(K_{m,n})$  and Complete Graph  $K_n$ .

**SECTION C**

- 3. Attempt any one part of the following: 10 x 1=10**
- (a) The contrapositive of statement is given as "If  $x < 2$  then  $x+4 < 6$ ". Write the statement, converse and inverse for that given contrapositive.
  - (b) Given In order and Post order traversal of the tree T  
 In order : BEHFACDGI  
 Post order : HFEABIGDC  
 Determine the Binary tree and its preorder also.

- 4. Attempt any one part of the following: 10 x 1=10**

- (a) Solve Recurrence Relation  $a_r - 6a_{r-1} + 8a_{r-2} = r \cdot 4^r$   
(given  $a_0 = 8, a_1 = 22$ )
- (b) Prove the following by principle of mathematical induction  $\forall n \in \mathbb{N}$ , Product of two consecutive natural number is even.

**5. Attempt any two parts of the following: 5 x 2 = 10**

- (a) There are 500 boxes with apples. Each contains no more than x apples, find the maximum possible value of x such that one can ensure to find 3 boxes containing equal no of apples.
- (b) What is Euler Graph; define Euler Circuit and Euler path with example.
- (c) What is Hamiltonian Graph; define Hamiltonian Cycle and Hamiltonian path with example.

**6. Attempt any one part of the following: 10 x 1 = 10**

- (a) Let  $A(x)$ : x is student.  $B(x)$ : x is clever.  $C(X)$ : x is successful.  
Express following using quantifier
  - i) "There exists a student".
  - ii) "Some students are clever".
  - iii) "Some students are not successful".

- (b) What is the coefficient of  $x^3y^2z^2$  in  $(x + y + z)^9$  ?

**7. Attempt any one part of the following: 10 x 1 = 10**

- (a) Define Isomorphism and Homeomorphism of Graph with examples.
- (b) In the following Hasse Diagram find the GLB and LUB for  $A = \{2, 3, 6\}$  and also find GLB and LUB for  $B = \{6, 12\}$ .

