

4E2917

Roll No. : _____

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B. Tech. (Sem. IV) (Main / Back) Examination, June/July - 2011
Computer Engg. & I.T.
4IT3 Discrete Mathematical Structures (Common with CS & IT)

Time : **3 Hours**][Maxi. Marks : **80**[Min. Passing Marks : **24**

Attempt any five questions. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. _____ Nil

2. _____ Nil

1 (a) Show that

$$p \rightarrow q \equiv (\sim p) \vee q$$

4(b) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.**4**(c) Show that $(p \wedge q) \wedge \sim(p \vee q)$ is a contradiction.**8****OR**

(a) Define the following

(i) Tautology

(ii) Contradiction

(iii) Contingency.

8**4E2917]****1****[Contd...**

(b) Check **the** validity of following argument

$$p \vee q$$

$$p \rightarrow \sim q$$

$$p \rightarrow r$$

$$\therefore r$$

8

2 (a) Give an **indirect** proof of the theorem "If $3n+2$ is odd, then n is odd".

8

(b) Show **that** $\sqrt{2}$ is irrational

8

OR

(a) Show **that** if n is an integer greater than 1, then n is either a prime **or** a product of primes.

8

(b) Sort the **list** $x = [64, 25, 12, 11]$ using selection sort algorithm.

8

3 (a) Show **the** sum of the degrees of all the vertices in a graph is equal **to** twice the number of edges in the graph.

8

(b) Prove **that** a simple with n vertices and k components can have at **most** $(n-k)(n-k+1)/2$ edges.

8

OR

(a) Prove **that** the chromatic number of a graph will not exceed by more **than** one, the maximum degree of the vertices in a graph.

8

(b) Prove **that** a graph is a tree if and only if it is minimally connected.

4

(c) Find **the** complexity of a complete graph K_3 .

4



- 4 (a) Let 100 of the 120 students of mathematics at a college take at least one of the languages Hindi, English and German. Also, let 65 study Hindi, 45 study English and 45 German. If 20 study Hindi and English, 25 study English and German and 15 study Hindi and German. Find the number of students who study all the three languages. 4
- (b) Let $A = \{a,b,c,d,e\}$ and $B = \{c,e,f,h,k,m\}$ then prove if A and B are finite sets then $|A \cup B| = |A| + |B| - |A \cap B|$. 4
- (c) Show that the set of even positive integers is a countable set. 8

OR

- (a) Determine whether each of the following functions is a bijection from $R \rightarrow R$
- (i) $f(x) = -3x + 4$
- (ii) $f(x) = -3x^2 + 7$ 8
- (b) If $(n+1)$ integers are selected from the set $\{1,2,\dots, 2n\}$ then show that one of them divides another integer that has been selected. 8
- 5 (a) Define the following with example
- (i) Reflexive relation
- (ii) Symmetric relation
- (iii) Transitive relation
- (iv) Antisymmetric relation 8
- (b) Show that $(\mathbb{Z}^+, \text{divisibility})$ is a poset 8

OR

- (a) Show that in the set of integers $I = \{\dots, -2, -1, 0, 1, 2, \dots\}$, the relation $aRb \Rightarrow a \equiv b \pmod{n}$, $n \in \mathbb{N}$, is an equivalence relation. 8
- (b) Show that an equivalence relation defined in a set A decomposes the set into disjoint classes. 8

