Total No. of Pages: 2 —78— Roll No.....

3rd Semester B.Tech. (COE)

Supplementary Examination (February 2019)

CO 205: Discrete Structures

Duration: 3 Hours **Maximum Marks: 50**

Instructions:

- *First question is compulsory. Attempt any two parts from the remaining questions.*
- *Calculator is allowed.*
- *Assume missing data suitably (if any).*

1. **(a)** Write the contrapositive, the converse, and the inverse of the following statement.
"A positive integer is a prime only if it has no divisors other than 1 and itself" [2]

(b) Define strong mathematical induction. [2]

(c) How many different messages can be represented by sequence of three dashes and two dots? [2]

(d) Define Boolean algebra with example. [2]

(e) What is chromatic number of a graph? Briefly explain. [2]

2. **(a)** Suppose that there are 21 cricket players in the Indian team. Out of these 6 players are taking part in a one-day match, 7 players are taking part in T-20 match and five players are taking part in both one-day and T-20 matches. How many players are not taking part either in one-day or in T-20 match? [5]

(b) Suppose that in the Hasse diagram of a partially ordered set, a vertex c is "above" another vertex a, but there is no line from a to c. Can we conclude that $a \leq c$? Explain with example. [5]

(c) In a Boolean algebra show that $ab' + a'b = 0$ if and only if $a = b$. [5]

3. **(a)** Use mathematical induction to show that $H_{2^n} \geq 1 + \frac{n}{2}$, where

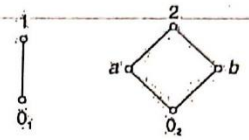
$$H_n = 1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{n}.$$ [5]

P.T.O.

(b) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0,\ n \geq 2,\ a_0 = 1, a_1 = 9$. [5]

(c) Let $f(n) = 5f\left(\frac{n}{2}\right) + 3$ and $f(1) = 7$. Find $f(2^k)$ where k is a positive integer. Also, estimate $f(n)$ if f is an increasing function. [5]

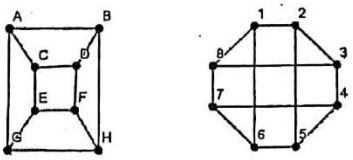
4. (a) Let $(L_1, *, +)$ and $(L_2, \wedge, \vee)$ be two lattices. Define the direct product $L_1 \times L_2$ and find the direct product of the lattices given below. [5]



(b) Define a partially ordered set. Check whether $(P(X), \subseteq)$ is a chain where X is a set and $P(X)$ is the power set of X. [5]

(c) In a distributive lattice, show that
$(a * b) \oplus (b * c) \oplus (c * a) = (a \oplus b) * (b \oplus c) * (c \oplus a)$. [5]

5. (a) Define graph isomorphism. Are the following two graphs isomorphic?



[5]

(b) Prove that a Tree with n vertices has $n-1$ edges. [5]

(c) Define spanning tree and prove that a graph is connected if and only if it has a spanning tree. [5]

~All the best~