

Dr. Hemraj Saini

Roll No.: _____

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- February 2020

B.Tech. IV Semester

COURSE CODE: 18B11CI414

MAX. MARKS: 15

COURSE NAME: Discrete Computational Mathematics

COURSE CREDITS: 3

MAX. TIME: 1 Hrs

Note: All questions are compulsory and carrying equal marks. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q.1. [06 Marks; CO1]

- (A) Explain, without using a truth table, why $(p \vee \neg q) \wedge (q \vee \neg r) \wedge (r \vee \neg p)$ is true when $p, q,$ and r have the same truth value and it is false otherwise.
- (B) Express these system specifications using the propositions p "The user enters a valid password," q "Access is granted," and r "The user has paid the subscription fee" and logical connectives (including negations).
- "The user has paid the subscription fee, but does not enter a valid password."
 - "Access is granted whenever the user has paid the subscription fee and enters a valid password."
 - "Access is denied if the user has not paid the subscription fee."
 - "If the user has not entered a valid password but has paid the subscription fee, then access is granted."
- (C) Show that $(p \vee q) \wedge (\neg p \vee r) \rightarrow (q \vee r)$ is a tautology.

Q.2 [06 Marks; CO1]

- (A) Use resolution to show the hypotheses "Allen is a bad boy or Hillary is a good girl" and "Allen is a good boy or David is happy" imply the conclusion "Hillary is a good girl or David is happy."
- (B) Show that these three statements are equivalent, where a and b are real numbers: (i) a is less than b , (ii) the average of a and b is greater than a , and (iii) the average of a and b is less than b .
- (C) Use mathematical induction to prove divisibility facts that 21 divides $4^{n+1} + 5^{2n-1}$ whenever n is a positive integer.

Q.3 [03 Marks; CO1]

- (A) Set A comprises all three digit numbers that are multiples of 5, Set B comprises all three-digit even numbers that are multiples of 3 and Set C comprises all three-digit numbers that are multiples of 4. How many elements are present in $A \cup B \cup C$?
- (B) Let f be the function from $\{a, b, c\}$ to $\{1, 2, 3\}$ such that $f(a) = 2, f(b) = 3,$ and $f(c) = 1$. Is f invertible, and if it is, what is its inverse?