

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- APRIL-2023

COURSE CODE(CREDITS): 18B11CI414 (3)

MAX. MARKS: 25

COURSE NAME: DISCRETE COMPUTATIONAL MATHEMATICS

COURSE INSTRUCTORS: RKB, BKP, PKP*

MAX. TIME: 1 Hour 30 Minutes

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

1. (a) Consider a relation R defined on $N \times N$ by $(a, b)R(c, d)$ if $ad = bc$, N is set of natural numbers. Is R an equivalence relation? If yes, justify your answer properly in steps and find equivalence class of $(1, 3)$.

[3] [CO3]

(b) Draw the Hasse Diagram of D_{100} under the partial order relation of divisibility.

[2] [CO3]

2. Using the notion of generating function, solve the following recurrence relation:

[4] [CO7]

$$a_k = 5a_{k-1} - 6a_{k-2}; k \geq 2; \text{ given } a_0 = 1, a_1 = 0.$$

3. Using truth table, examine the validity of the following argument:

[3] [CO1]

If I try hard and I have talent, then I will become an engineer.

If I become an engineer, then I will be happy.

Therefore, if I will not be happy, then I did not try hard or I do not have talent.

4. Show that $8^n - 3^n$ is a multiple of 5 for $n \geq 1$ with the help of mathematical induction. [3] [CO2]

5. (a) Consider the predicate $P(x): x \geq 2$; over the domain of real numbers. Determine the truth value of " $P(-4) \rightarrow P(2)$ ". Give reason in support of your answer. [1.5] [CO2]

(b) Write the negation of $\forall x \forall y \exists z (x^2 + y^2 - 2z > 0)$.

[1.5] [CO2]

6. Consider a statement "If Johnson is an engineer, then he is rich".

[3] [CO1]

(a) Write the above statement without the help of implication.

(b) Write the negation of the above statement.

(c) Write the inverse of the above statement.

7. Show that the lattice $(D_{70}, |)$ is a complemented and distributed lattice.

[4] [CO3]
