

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2022

B.Tech-IV Semester (CS/IT)

COURSE CODE (CREDITS): 18B11CI414(3)

MAX. MARKS: 35

COURSE NAME: Discrete Computational Mathematics

COURSE INSTRUCTORS: Dr.Neel Kanth and Dr.P.K Pandey

MAX. TIME: 2 Hours

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

Q1. (a). Using truth tables prove or disprove that $p \rightarrow q$ is logically equivalent to $\sim q \rightarrow \sim p$.

(b). Prove or disprove that $(p \rightarrow q) \rightarrow (p \wedge q)$ is a contradiction. [CO-1][2+2]

Q2. Among the following, find a collection of subsets that forms a partition of $2\mathbb{Z}$.

(write all steps to verify your claim).

$A = \phi, B = \{0\}, C = \{0, 2\}, D = \{2, 4, 6, \dots\}, E = \{-2, -4, -6, \dots\}$ [CO-2] [2]

Q3. Consider the set D_{18} with divisibility $|$ relation defined on it. Verify whether this divisibility relation is an equivalence relation or not? [CO-3] [3]

Q4.(a) Show that set of all even integers (including zero) is a group with additive property.

(b) Show that the set $R = \{0, 1, 2, 3, 4\}$ is a ring with respect to addition and multiplication modulo 5 [CO-6][2+3]

Q5. Using the generating function solve the following recurrence relation:

$$a_n - 3a_{n-1} + 2a_{n-2} = 0, n \geq 2,$$

given that $a_0 = 2$, and $a_1 = 3$.

[CO-7][3]

Q6. Consider the set D_{60} with divisibility $|$ relation defined on it.

[CO-5]

(a) Draw the Hasse diagram of D_{60} [1]

(b) Show that D_{60} is a lattice. [3]

(c) Is D_{60} a complemented lattice [2]

Q7. Draw a binary tree which corresponds to algebraic expression

$E = (x + 3y)^4(a - 2b)$ and find preorder and postorder traversal of the tree obtained. [CO-4] [4]

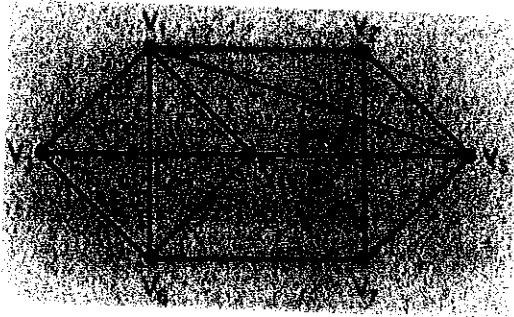
Q8.(a) Draw the directed graph corresponding to the adjacency matrix A and show that sum of in degrees and out degrees is twice the number of edges.

$$A = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

(b) Draw the graph K_4 and then draw its dual.

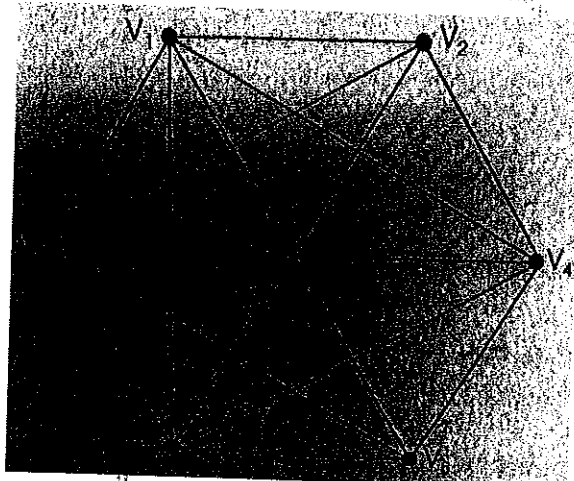
[CO-4][2+2]

Q9. For the given graph use Welch-powell algorithm to colour the vertices and what is the chromatic number of this graph.



[CO-4][2]

Q10. Using Kuratowski's theorem find whether the given graph is planar or not.



[CO-4][2]