(Please write your Exam Roll No.) Exam Roll No. 01325502723

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024

Paper Code: CIC-205 Subject: Discrete Mathematics

Time: 3 Hours Maximum Marks: 60

Note: Attempt five questions in all including Q. No. 1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Answer all of the following questions briefly: (4x5=20)

(a) Explain chromatic number of graph with example.

(b) Determine the contrapositive of the statement "if John is a poet, then he is poor."

(c) Define cyclic permutation. Give an example.

(d) Differentiate between oriented and unoriented graph.

(e) Shows that $(p \wedge q) \rightarrow (p \vee q)$ is tautology.

UNIT-I

Q2 (a) Define the following term with the help of an example: (4)

(i) Equality of set

(ii) Power set

(iii) Equivalent set

(iv) Disjoint set

(b) Shows that the premises "A student in the class has not read the book" and "everyone in the class passed the first exam" implies the conclusion "someone who passed the first exam has not read the book". (6)

Q3 (a) Using proof of contrapositive prove that "if $xy \in z$ (set of integer) such that xy is odd then both x and y are odd. (5)

(b) State and prove the principle of inclusion and exclusion for n number of set. (5)

UNIT-II

Q4 (a) Prove that a given set B={1, 2, 3, 5, 30} is lattice for the given condition "is divisible by". (4)

(b) Evaluate the condition of function to be: (3)

(i) Injective

(ii) Surjective

(iii) Bijective

(c) Find out the sequence generated by the recurrence relation $T_n = 2T_{n-1}$ with $T_1 = 4$(initial condition). (3)

Q5 (a) Minimize the given function using K-map

$\bar{A}\bar{B}CD + \bar{A}BCD + ABCD + A\bar{B}CD + ABC\bar{D} + AB\bar{C}D + ABC\bar{D}$ (5)

(b) For the first order linear recurrence relation, proved that $a_n = c^n a_0$ (5)

UNIT-III

Q6 (a) Let G be the set of all positive rational number and * be the binary operation on G define by $a*b = ab/7$ for all $a, b \in G$. Prove that $(G, *)$ is an abelian group. (5)

(b) Find the all coset of $H = \{0, 4\}$ in the group $G = \{Z_8, +_8\}$ (5)

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Q7 (a) State and prove Coset Lagrange's theorem. **(5)**

(b) Explain homomorphism and isomorphism with example. **(2)**

(c) Prove that $Z_4 = \{0, 1, 2, 3\}$ is an abelian group with respect to addition modulo 4. **(3)**

UNIT-IV

Q8 (a) State and prove five color theorem. **(5)**

(b) Define Euler path and Euler circuit with the help of example. **(2)**

(c) If there are 20 vertices, each of degree 3, then into how many regions does a representation of this planer graph split the plane? **(3)**

Q9 (a) State and prove Euler's formula. **(5)**

(b) Explain BFS algorithm in detail with a suitable example. **(5)**

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