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BTECH
(SEM III) THEORY EXAMINATION 2021-22
DISCRETE STRUCTURES & GRAPH THEORY

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

a.	Draw the hasse diagram of D_{30} .
b.	Explain the main conditions for group.
c.	Define set and their cardinality with examples.
d.	Define Symmetric and Asymmetric relation with suitable example.
e.	Write a short note on ONTO function.
f.	Explain the complement of an element in lattice.
g.	Define universal gates with examples.
h.	Discuss Tautology vs Contradiction.
i.	Construct circuit for the Boolean expression $Q = AB + A'B$
j.	Find the converse and inverse of statement "If I work hard then I will pass the exam".

SECTION B**2. Attempt any three of the following:****10x3=30**

a.	Prove that: $A - (B \cap C) = (A - B) \cup (A - C)$ For all sets A, B and C.
b.	Consider the functions $f, g: R \rightarrow R$, defined by $f(x) = 2x + 3$ and $g(x) = x^2 + 1$ Find the composition function $(g \circ f)(x)$ and $(f \circ g)(x)$
c.	Prove that number of vertices having odd degrees in a graph is always even.
d.	Construct the truth table for following: $((P \rightarrow Q) \vee R) \vee (P \rightarrow Q \rightarrow R)$
e.	Define and explain the following by suitable examples: i. Permutation group ii. Cosets iii. Ring iv. Field

SECTION C**3. Attempt any one part of the following:****10x1=10**

a.	Let $G = \{1, -1, i, -i\}$ with binary operation as <i>multiplication</i> be an algebraic structure where $i = \sqrt{-1}$ i. Determine whether G is an abelian group. ii. If G is a cyclic group, then determine the generators of G.
b.	What are the recursive functions? Give the recursive definition of factorial function.



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4. Attempt any one part of the following: 10x1=10

a.	Write short notes on the following: i. Planar graph ii. Isomorphism of graph iii. Bipartite Graph iv. Chromatic number of graphs
b.	Simplify using K-Map: $F(A, B, C, D) = \Sigma(0, 2, 3, 5, 7, 8, 10, 11, 12, 15)$

5. Attempt any one part of the following: 10x1=10

a.	What are the different ways to represent a graph? Define Euler Circuit and Euler Graph. Also, give necessary and sufficient conditions for euler circuits and paths.
b.	Solve the given recurrence relation using generating function: $a_n - 2a_{n-1} + a_{n-2} = 0, n \geq 2$, initial condition $a_0 = 3$ and $a_1 = -2$.

6. Attempt any one part of the following: 10x1=10

a.	State and prove pigeonhole principle.
b.	Define a binary tree. A binary tree has 11 nodes. Construct the tree based on following traversal sequences and also find its postorder traversal: Preorder: A B D H I E J K C F G Inorder: H D I B J E K A F C G

7. Attempt any one part of the following: 10x1=10

a.	Illustrate using mathematical induction if 'n' is a positive integer, then $11^{n+1} + 12^{2n-1}$ is divisible by 133.
b.	Illustrate using mathematical induction that $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each integer.