

Code No: 154AQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, July/August - 2021

DISCRETE MATHEMATICS

(Common to CSE, IT)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Give a direct proof and an indirect proof, "If n is an odd integer, then $(n + 9)$ is an even integer".
- b) Show the following statement is a tautology.

$$\neg P \wedge (\neg P \wedge Q) \rightarrow \neg Q$$
[7+8]

- 2.a) Let $X = \{1,2,3,4,5,6,7\}$ and $R = \{x, y \mid x - y \text{ is divisible by } 3\}$ in X . Show that R is an equivalence relation.
- b) Let the function $f: N \rightarrow N$ and $g: Z \rightarrow N$ be defined as follows
 $f(x) = 3x + 2$ and $g(x) = x^2 + 1$ specify the functions.
 i) $f \circ g$ ii) $g \circ f$.
 If they exist, and give a valid argument if one/some of them do not exist. [7+8]

3. Check whether proposition $\sim A \leftrightarrow B \wedge C \vee \sim A \rightarrow B$ is well-formed, providing step-by-step tracing of the algorithm. [15]

- 4.a) Explain the principle of strong induction with example.
- b) Using induction principles prove that $n^3 + 2n$ is divisible by 3. [7+8]

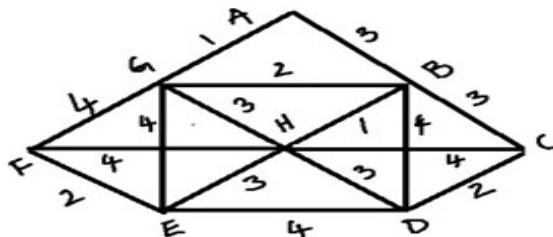
5. Find the general solution for the recurrence relation.
 $T(n) - T(n-1) = 4(n + n^3)$, where $n \geq 1$, and $T(0) = 5$. [15]

- 6.a) How many solutions does $x_1 + x_2 + x_3 = 11$ have, where x_1, x_2 , and x_3 are nonnegative integers with $x_1 \leq 3, x_2 \leq 4$, and $x_3 \leq 6$?
- b) How many bits of string of length 10 contain
 i) Exactly four 1's ii) At most four 1's. [7+8]

7. Define Graph. Graph „G“ is represented by the following adjacency matrix.

$$\begin{matrix} & A & B & C & D & E & F & H & I & M \\ \begin{matrix} A \\ B \\ C \\ D \\ E \\ F \\ H \\ I \\ M \end{matrix} & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \end{matrix}$$
 - a) Draw the Graph.
 - b) Determine whether G is a tree. Justify your answer?
 - c) Determine whether G is Eulerian graph. Justify your answer?
 - d) Determine whether G is Hamiltonian graph. If it is so, provide a Hamiltonian cycle on G . [3+4+4+4]

8. Show, step by step kruskal's algorithm on the following connected weighted graph and also calculate sum of the weights of the minimal spanning tree? [15]



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