U. G. 4th Semester Examination 2022

B.C.A. (Honours)

Paper Code : DC-8

Discrete Mathematics

[CBCS]

Full Marks : 32   Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group - A

Answer any *six* questions from question no. 1   2×6=12

1. (a) In a class of 100 students of Computer Science, 56 secured Grade-A in Digital Logic and 42 secured Grade-A in Operating System. If 32 didn't secure Grade-A in either of them, how many students secured Grade-A in both?

   (b) What is equivalence relation? Explain with example.

   (c) Prove that the number of pendant vertices in a binary tree is $\frac{n+1}{2}$, where n is the number of vertices in the tree.

   (d) Show that $(q \rightarrow p) \wedge (\sim p \wedge q)$ is a contradiction.

   (e) How many words can be formed using the A thrice, the letter B twice and the letter C thrice?

   (f) How many buildings must be painted with 3 different random colors to ensure that at least 20 will have same color?
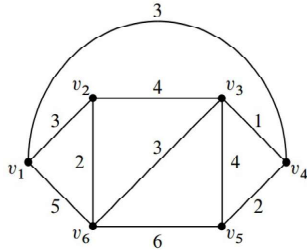
   (g) Briefly explain incidence matrix.

[P.T.O.]

Group - B

Answer any *two* questions. 10×2=20

2. (a) Find the Minimum Spanning Tree (MST) using Prim's algorithm for the following graph.

   (b) Compare the previous result with the MST from Kruskal's algorithm. 6+4=10

3. (a) Solve the following recurrence relation-

   $a_n = 2a_{n-1} + 8a_{n-2}$, $n \geq 2$ with initial condition $a_0 = 4$, $a_1 = 10$.

   (b) State the generalized principle of inclusion and exclusion.

   (c) A coin is tossed 10 times. How many possible outcomes (i.e. sequence of heads and tails) are there? 6+2+2=10

4. (a) Find the solution for the following recurrence relation-

   $T(n) = 2T(n/2) + cn$, where $n \geq 2$, $T(1)=1$.

   (b) Explain big-O with example.

   (c) Solve following recurrence relation-

   $x_n - x_{n-1} - 2x_{n-2} = 1$ $n \geq 3$, with initial conditions $x_1=1$ and $x_2=3$.

   3+2+5=10

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