Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 02]

Uni. Roll No. …….

Program: B.Tech.
Semester: 5th
Name of Subject: Discrete Mathematics
Subject Code: PCIT-110
Paper ID: 16441

11-01-2022(E)

Time Allowed: 02 Hours **Max. Marks: 60**

NOTE:

1) Each question is of 10 marks.
2) Attempt any six questions out of nine.
3) Any missing data may be assumed appropriately.

Q1. a) Solve the recurrence relation $S_r-6S_{r-1}+9S_{r-2}=(r+1)3^r$. (5)

b) Consider the function $f : N \to N$, where N is the set of natural numbers, defined by $f(x)=x^2+x+1$. Classify function f as one-one or onto or both. (5)

Q2. a) Determine the minimum number of students in a class to be sure that three of them are born in the same month. (5)

b) Let R be a binary relation defined as $R= \{(a, b) \in R^{2:} (a-b) \leq 3\}$. Determine whether R is reflexive, symmetric, anti-symmetric and transitive. (5)

Q3. Solve the recurrence relation using generating functions: $P_r - 3P_{r-1} + 2P_{r-2} = 0$ for $r \geq 3$ with initial conditions $P_1= 5$, $P_2=3$.

Q4. a) Prove the validity of the following argument "If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. I will not be happy. Therefore, either I will not get the job or I will not work hard". (5)

b) Construct the DNF of the formula:

$(\neg(P \vee Q) \Leftrightarrow (P \wedge Q)$. (5)

Q5. a) If A= set of rational numbers and B= $\{x: x^2- 4x + 2=0\}$, then Solve $A \cap B, A - B, B - A$. (5)

b) Discover the number of different words that can be formed with the letters of the word BHARAT? Determine the number of these in which:

i) B and H are never together.

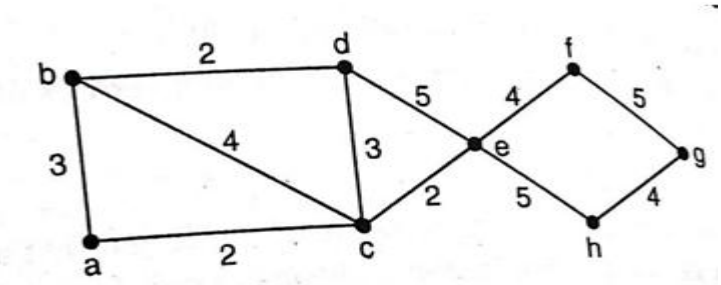
ii) Begin with B and end with T? (5)

Q6. Prove that the fourth roots of unity forms an abelian multiplicative group.

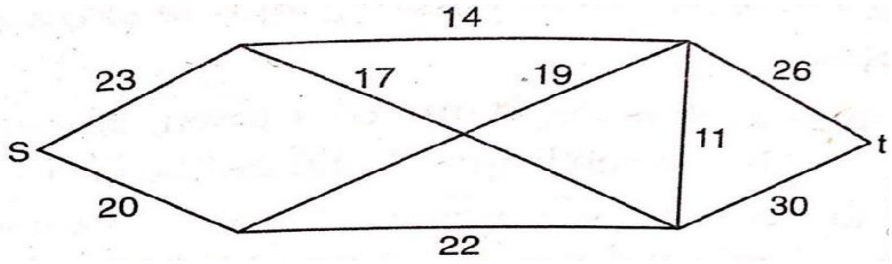
Q7. Identify minimum spanning tree for the following weighted connected graph using:

a) Prim's algorithm. (5)

b) Kruskal's algorithm. (5)



Q8. Apply Dijkstra's Algorithm to choose the shortest path from s to t.



Q9. a) Compare Hamiltonian and Eulerian chains with suitable examples. (5)

b) Classify the ring: R= {0, 2, 4, 6, 8 } $+_{10}$, $\times_{10}$. What is the unity of this ring? Is it the ring with or without zero divisors? (5)

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