2019

Full Marks - 40

Time - 3 hours

The questions are of equal value.

Answer ***all*** questions

1. Write brief answers on the following :

   a) What is equivalance relation ? Explain with an example.

   b) Define Pigeonhole Principle and explain with an example.

   c) Define Euler graph and Hamilton graph.

   d) What are different types of FA exist with memory ?

2. a) Using mathematical induction prove that

$$1+\frac{1}{4}+\frac{1}{9}+.....+\frac{1}{n^2} \leq 2-\frac{1}{n}, \forall n \in N$$

b) Prove that if an integer a for which $(a-2)$ is divisible by 3 then a^2-1 is divisible by 3.

OR

c) Let $A=\{1, 2, 3, \ldots. 7\}$ and $R=\{(x, y) \mid (x-y)$ is divisible by $3\}$ in A. Show that R is an equivalance relation.

d) Fins out the transitive closure of R of $R=\{(1, 2), (2, 3), (3, 4), (4, 5), (5, 1)\}$.

3. a) Find the number of ways in which 8 men and 4 women stand in a circle such that two women are next to each other.

b) State and proof method of inclusion and exclusion.

OR

Solve the recurrence relation

$a_n = 7a_{n-2} + 6a_{n-3}$, $a_1=3$, $a_2=6$, $a_3=10$.

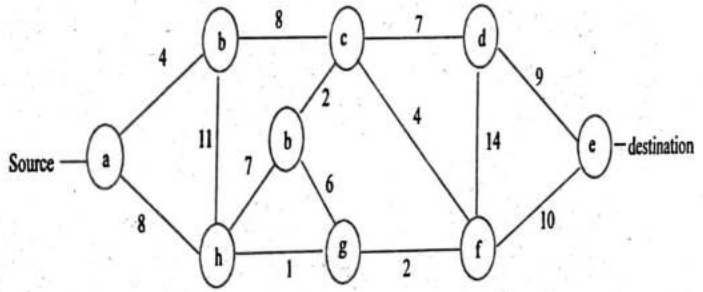
What is the degree of this linear homogeneous relation ?

4. a) Prove that a simple non-directed graph G is a tree off G is connected and contains no cycle and also prove there is atleast one vertex with degree 1.

b) Let the number of edges of a graph be m and number of verticles be n, then show that G has a Hamiltonian circuit if $n \geq \frac{1}{2}(n^2-3n+6)$

OR

Write Prim's algorithm and implement it to find MST for the given problem



5. a) Construct NFA for the re $(0+1)^*(00+11)(0+1)^*$ and convert it into DFA.

[Turn Over

b) Construct a DFA which accept set of all string divisible by 5 where $\Sigma = \{0, 1\}$.

OR

c) Design a PDA for $L = \{a^n ba^n \mid n \geq |\}$

d) Design a TM over $\Sigma = \{1, b\}$ to accept the language $L = \{ww^R / w \in (a, b)^+\}$.

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