Code No. 15046/AICTE

FACULTY OF ENGINEERING

B.E. III- Semester (AICTE)(CSE) (Main & Backlog) Examination, July 2021

Subject : Discrete Mathematics

Time : 2 Hours **Max. Marks: 70**

Missing data, if any may be suitably assumed.

PART – A

Note: Answer any Five Questions **(5x2= 10 Marks)**

1. Write Truth Table for the Biconditional $p \leftrightarrow q$
2. Write Mersenne Prime numbers.
3. How many permutations of the letters ABCDEFGH contain the string CDEF?
4. Use mathematical induction to prove that $2^n < n!$ for every positive integer n with $n \geq 4$
5. Let X be the number that comes up when a die is rolled. What is the expected value of X?
6. A set contains 5 elements. Find the number of Derangements with 5 elements
7. What is Relational Database and differentiate between Primary Key and Composite Key
8. Compare Euler circuit and Euler Path, Hamiltonian circuit and Hamiltonian path
9. 'Construct DFS and BFS Graph for the figure 1.
10. Solve the following Boolean function using Boolean theorems

    $f(x, y, z) = x' y' z' + x' y' z + x y z' + x y z$

PART- B

Note: Answer any Four Questions **(4x15= 60 Marks)**

11. a) Describe the best and worstcase Time Complexity of Linear Search algorithm.
    b) A number is not known but when divided by 3, the remainder is 2; when divided by 5, the remainder is 3; when divided by 7, the remainder is 2; Find that number?

12. a) Get the coefficient of $x^{12} y^{13}$ in the expansion of $(2x - 3y)^{25}$
    b) Prove, by Mathematical Induction, that the sum of squares of the first n natural numbers is $n(n+1)(2n+1)/6$

13. a) What is the variance of getting Heads as an outcome, where the outcome is the number of heads, when three fair coins are flipped?

b) List all prime numbers not exceeding 100 by the principle of inclusion-exclusion.

14.a) Obtain the zero-one matrix of the transitive closure of the relation R where

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

b) Find the shortest path between the source node (A) and the destination node (H) from the given. weighted Graph by using Dijkstra's algorithm

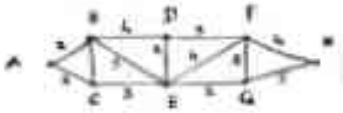

Fig- 1

15 .a) Derive a Minimum Spanning Tree from the given weighted Graph by using Kruskal's algorithm

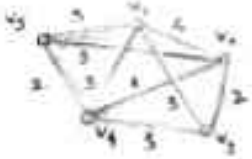

Fig- 2

b) Draw graphical symbols of XOR and XNOR gates and find the output if these gates. are connected to an OR gate

16.a) Solve the recurrence relation $a_n - 3a_{n-1} - 4a_{n-2} = 4^n$

b) Create a Minimum Spanning Tree from the following Graph by using DFS algorithm.

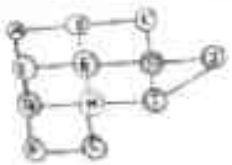

Fig- 3

17.a) Illustrate Select, Projection and Join operations on any n-relation on Databases.

b) $a \equiv b \bmod m$ is an equivalence relation, Justify this, where a and b are integers and m is a positive integer > 1.

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