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TMA–301

B. TECH. (CSE) (THIRD SEMESTER)
END SEMESTER EXAMINATION, 2019
FUNDAMENTALS OF GRAPH THEORY AND DISCRETE MATHEMATICS

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Total marks assigned to each question are **twenty.**

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What is Mathematical Induction ? Prove that P (n) : $1.1! + 2.2! + \ldots + n.n! = (n+1)! - 1, n >= 1$.

(b) What is the difference between permutation and combinations ? 6 boys and 6 girls are to be seated in a row. How many ways can they be seated if :

(i) All boys are to be seated together and all girls to be seated together.

(ii) No two girls be seated together.

(iii) Boys occupy extreme positions.

(c) What is recurrence relation ? Solve the recurrence relation :

$$a_n - 4a_{n-1} + 4a_{n-2} = 3^n + 4$$

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

   (a) Number of students who got Grade A in first exam is equal to that of in second exam. If total number of students who got grade A in exactly one exam in 40 and 4 students did not get grade A in either exams, determine the no. of students who got grade A in first exam only, who got grade A in second exam only and who got grade A in both the exams.

   (b) What is a proposition and compound propositions ? What are the laws of laws of algebra of propositions ?

   (c) What are normal forms ? Obtain the DNF and CNF of $p <-> (\bar{p} \vee \bar{q})$.

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

   (a) Check the validity of the following argument : "If I study, then I will pass in examination. If I do not go to cinema, then I will study. But I failed in examination. Therefore, I went to cinema."

   (b) What are function and its types ? What are the steps to find the inverse of a function. Hence find the inverse of $f(x) = \sqrt[3]{x-3}$.

   (c) What is a relation ? How many types relations are there ? Explain each with example.

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

   (a) Construct the graphs with the following properties :

      (i) Edge Connectivity of G = 4, Vertex Connectivity of G = 3 and Degree of every vertex of G >= 5.

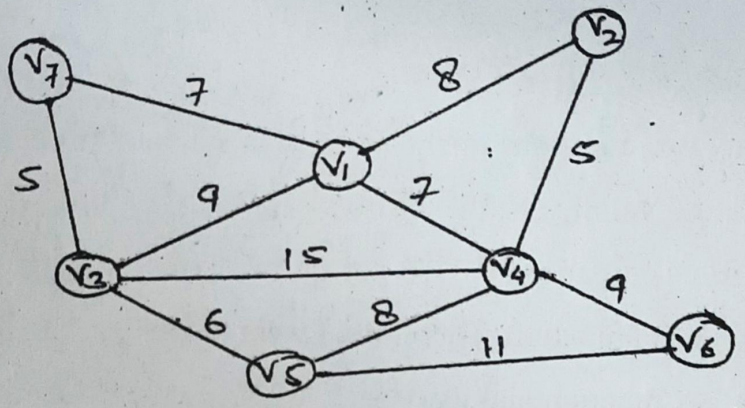
      (ii) Euler but not Hamiltonian.

(b) Construct a BST with the following keys : {25, 20, 30, 15, 24, 23, 28, 35, 14, 18, 23, 26, 29}. Find inorder, preorder and postorder. Delete the key 20.

(c) Explain vertex, edge and region coloring of a graph with example. What is the chromatic number of C_n, W_n, K_n & Tree.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

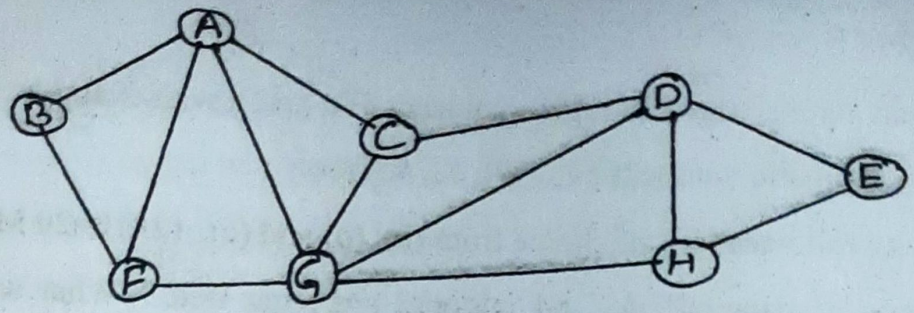
(a) What is a spanning tree and minimal spanning tree ? What are the various methods to find a minimal spanning tree ? Apply any of the algorithms to find the minimal spanning tree for the graph given below :



(b) What is the differentiate between Breadth first search and Depth first search and then apply it on the graph represented by the following matrix as :

	A	B	C	D	E	F
A	0	1	0	1	0	1
B	1	0	1	1	1	0
C	0	1	0	1	1	1
D	1	1	1	0	1	1
E	0	1	1	1	0	1
F	1	0	1	1	1	0

(c) What is matching ? What is the difference between maximum and maximal matching ? Find the vertex cover for the given graph :



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