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16/17MCA33

Third Semester MCA Degree Examination, June/July 2019
Analysis Design of Algorithms

Time: 3 hrs.

Max. Marks: 80

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. If $t_1(n)$ t0 ($g_1(n)$) and $t_2(n)$ t0 ($g_2(n)$) then prove that $t_1(n) + t_2(n) \in 0$ (max $\{g_1(n), g_2(n)\}$). (08 Marks)

   b. Define an algorithm and analyze the fundamentals of algorithmic problem solving. (08 Marks)

OR

2 a. Demonstrate the asymptotic notations and explain with an examples. (08 Marks)

   b. Algorithm Enigma (A[0…n-1, 0…n-1])
   //Input : A matrix (A[0….n-1, 0…n-1]) of real numbers
      for i $\in$ 0 to n-2 do
      for j $\in$ i+1 to n-1 do
        if A[c] > A[j] swap (a[i], a[j])
        return false
   Evaluate the following:
   i)   What is the input size?
   ii)   What is the basic operation?
   iii)   What is the basic algorithm compute?
   iv)   What is the efficiency class of this algorithm? (08 Marks)

Module-2

3 a. Analyze the time complexity of Bubble sort algorithm for the following numbers:
   189, 345, 468, 190, 290, 342, 171, 420 (08 Marks)

   b. Write an algorithm for brute force string matching and give an example. (08 Marks)

OR

4 a. Write quick sort algorithm to sort the given numbers in ascending order. Explain how the following numbers are sorted:
   12, 19, 13, 79, 75, 14, 23, 54. Find the time complexity of the same. (09 Marks)

   b. Binary tree traversals and related properties. (07 Marks)

Module-3

5 a. Explain Depth First Search (DFS) and write its applications. Give the DFS tree for the following graph and prove that graph's connected or not (starting node to be considered is 5). (08 Marks)
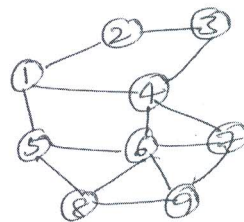
Fig.Q.5(a)

b. Write Prims algorithm and for the following graph find the minimum cost spanning tree.
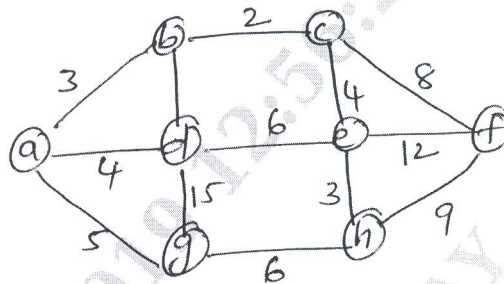
(08 Marks)

Fig.Q.5(b)

OR

6 a. Write Shonson's-Trotter's algorithm for generating permutations. Apply the same for n = 3.

(06 Marks)

b. Solve the following Huffman code for the following:

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

i) Encoder the text DAD
ii) Decode the numbers 10011011011101

(10 Marks)

Module-4

7 a. Write Horspools algorithm for string matching. Explain it with following inputs:
Text: JIM_SAW_ME_IN_A_BARBERSHOP
Pattern: BARBER

(09 Marks)

b. Write an algorithm for sorting by counting and apply the same for the following numbers:
62, 31, 84, 96, 19, 47

(07 Marks)

OR

8 a. Explain binomial coefficient with an algorithm.

(08 Marks)

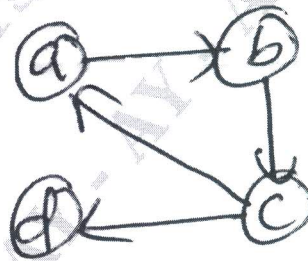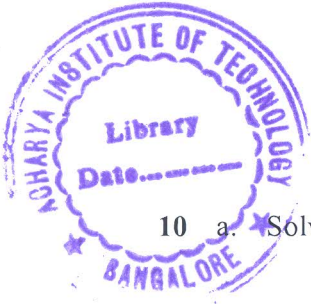b. Write Warshalls algorithm and apply the same for the following graph.

(08 Marks)

Fig.Q.8(b)

Module-5

9 a. Explain N, NP, NP complete problem.

(06 Marks)

b. Write short notes on decision trees.

(05 Marks)

c. Explain n-queen problem.

(05 Marks)

OR

10 a. Solve the assignment problem for the following:

$$C = \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \begin{matrix} \text{person a} \\ \text{person b} \\ \text{person c} \\ \text{person d} \end{matrix}$$

(with column headings Job1 Job2 Job3 Job4)

(08 Marks)

b. Using branch-bound technique solve the knapsack problem.

Item	Weight	Value	Value/weight
1	4	$40	10
2	7	$42	6
3	5	$25	5
4	3	$12	4

The knap sack
Capacity W = 10

(08 Marks)

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