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**University Examinations 2015/2016**

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR MASTER SCIENCE IN COMPUTER SCIENCE

**CCS 5151: DESIGN & ANALYSIS OF ALGORITHM**

**DATE: NOVEMBER, 2015 TIME:** $3$ **HOURS**

**INSTRUCTIONS: Answer question ONE and any other two.**

**QUESTION ONE (30 MARKS)**

1. Sate the running time of the algorithm below; (2 Marks)

for (i=1; i<n\*n;i++)

 for (j=0;<;j< i; j++)

 sum++;

1. Given the algorithm below find the order of the growth. (5 Marks)

T(n) = 4T(n/2) + $n^{2}$, where T(1) = 1

1. Write algorithm using iterative function to find sum of n numbers. (4 Marks)
2. There are 22 gloves in a drawer, 5 pairs of red gloves, 4 pairs of yellow and 2 pairs of green.You select the gloves in the dark and can check them only after a selection has been made. What is the smallest number of gloves you need to select to have at least one matching pair in the best case and worst case. (4 Marks)
3. Express the function ($\frac{n^{3}}{1000}- 100n^{2}- 100n+3)2^{n}$ in terms of $θ$ notation. (3 Marks)
4. Consider the graph below and draw the minimum spanning tree stating the weight(4 Marks)
5. Compare the order of growth of the algorithms 2(n-1) and $n^{2}$ using limits.(4 Marks)
6. Define network as a graph and explain one application of graph algorithm in network.

(4 Marks)

**QUESTION TWO (15 MARKS)**

Consider the graphs below and find minimum spanning tree;

1. Using kruskal algorithm. (7 Marks)
2. Prism algorithm taking root as node three. (7 Marks)
3. Compare the efficiency of the two algorithm. (1 Mark)

**QUESTION THREE (15 MARKS)**

Species X has gene sequence ATCTGAT and Y has gene sequences TGCATA, its suspected the two organisms have a common ancestors. The two organisms to be related they must have a longest common subsequence of at least four genes. By use of dynamic programming prove whether the species are related or not. (15 Marks)

**QUESTION FOUR (15 MARKS)**

1. Consider the elements below and using 45 as the root generate a binary search tree 45,36,76,23,89,115,98,39,41,56,69,48 (3 Marks)
2. Traverse the tree using Preorder, In order and post order. (6 Marks)
3. Consider the graph below and using stack show how depth search algorithm works. Assume increasing order of the alphabet and let root be A. (6 Marks)

**QUESTION FIVE (15 MARKS)**

Consider the code below to answer the questions that follow;

long power (long x, long n)

if (n = =0) return 1;

 if (n = =1) return x;

 if ((n % 2) = = 0)

 return power (x\*x, n/4) \*x;

1. Identify the base and recursion case. (3 Marks)
2. Using your own constants give the time it takes to solve a problem of size 0,1 and n

(3 Marks)

1. Using the time to solve a problem of size n, model a recurrence relation, use k for relation. (5 Marks)
2. Using the above derived recurrence relation and when the problem is of size T(1). Find the running time. (3 Marks)