School of Computer Science & Engineering,
KIIT UNIVERSITY
Mid_Semester Examination (June 2016)
Design & Analysis of Algorithm (CS-602)
3rd year BTech (CSE & IT)
Answer ALL Questions, Time: 2hours Marks:25

Question 1 [2+2+1]

1.a) Prove or disprove: $O(f(n) + g(n)) = f(n) + O(g(n))$, if f(n) and g(n) are positive for all n.

1.b) Prove that the recurrence $T(n) = m\,T(n/2) + an^2$ has the solution $T(n) = O(n^{\log_2 m})$

1.c) Consider the following algorithm:

```
demo()
{
        read(n);
        x=1;
        for i=1 to n do {x=x+2;}
        print(x);
}
```

what is the complexity of the algorithm? Clearly justify your answer.

Question 2 [2.5+2.5]

2.a) Prove that a complete binary tree of height k has $2^k - 1$ non leaf vertices and 2^k leaves

2.b) Consider the following sorting methods: Insertion Sort, Selection Sort, merge Sort, and Quick Sort. What is the running time using O- notation for each method

(i) When all the array values are equal?

(ii) When the values are in order?

(iii)When the values are in reverse order?

Explain your answers

Question 3 [2.5+2.5]

3a) Let G be an undirected graph with edge costs C_e, and $C_d = C_e + 1$. Let T be a MST of G and S be a shortest simple path from a node s to another node t, where both T and S are with respect to C_e. Then prove or disprove that (a) T is still a *MST* with respect to the edges costs C_d, (b) S is still a shortest path from s to t with respect to the edge costs C_d.

[P.T.O]

3b) Given a bag of capacity B and set of n elements, X_1, X_2, ...X_n, each with a weight W_i, and profit P_i, you are required to fill up the bag in such a way that the sum of its weight does not exceed b and the total profit is maximized. Present a efficient algorithm to solve the above problem. Explain the steps of your algorithm clearly.

Question 4 [2.5+2.5]

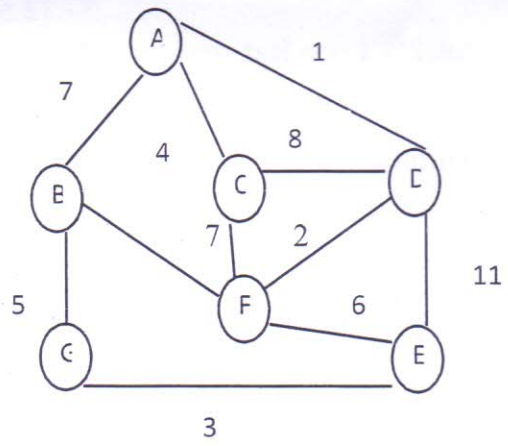
4a) What are the minimum and maximum numbers of elements in heap of height h? illustrate the operation Max_Heapify(A,3) on the array A={ 27,17,3,16,13,10,1,5,7,12,4,8,9,0}

4b) Suppose that we have a set of activates to schedule among a large number of lecture halls, where any activity can take place in any hall. We wish to schedule all the activities using as few lecture halls as possible. Present an efficient greedy algorithm to determine which activity should use which lecturer hall.

Question5 [2.5+2.5]

5a) What are the elements of greedy strategy?

5b)Consider the given graph G, Explain the working principle of DIJKSTRA'S ALGORITHM, What will be the Computational time?



******GOOD LUCK********