UPES

Roll No: ----------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech(CSE)-All IBM Courses **Semester – III**

Subject (Course): Design and Analysis of Algorithms **Max. Marks : 100**
Course Code :CGEG242 **Duration : 3 Hrs**
No. of page/s :02

Section A: Answer the following questions and each question carries 5 Marks

[4x5=20 Marks]

1. Write the algorithm for Iterative binary search?
2. Derive the worst case time complexity expression of Quick sort
3. Describe the steps in analyzing & coding an algorithm.
4. Write short notes on NP-hard and NP-completeness.

Section B: Answer the following questions [4x10=40 Marks]

5. Using Dynamic programming find the optimal solution to knapsack problems for the knapsack instance n=8,m=8,(p0,p2,p3…p7)=(11,21,31,33,43,53,55,65) and (w0,w2… w7)=(1,3,2,2,1,2,3,2). **[10 Marks]**

6. Write an algorithm for N QUEENS problem and trace it for n=4 **[10 Marks]**

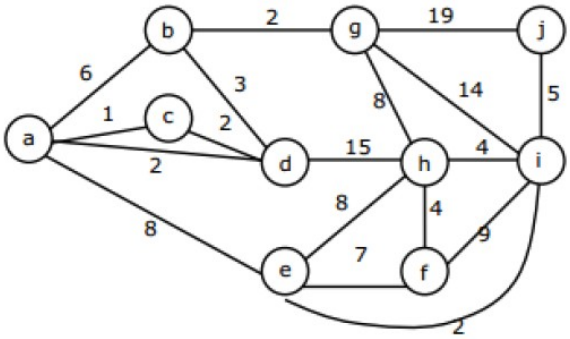
7. Explain merge sort algorithm with example **[10 Marks]**

8. What is spanning tree? Explain Dijikstra's Algorithm with an example **[10 Marks]**

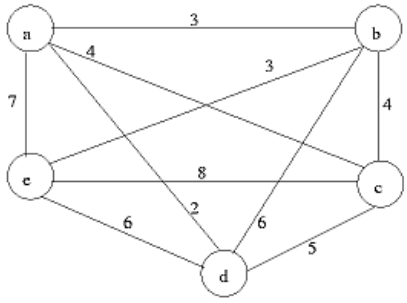
Section C: Answer any two questions

9. A).Write an algorithm to implement Chained matrix multiplication using dynamic programming **[10 Marks]**

B). Construct minimum spanning tree using Prim's algorithm **[10 Marks]**



10. A). Draw a solution space tree to solve the following travelling salesperson problem using Branch and Bound. Consider first vertex as the start vertex **[10 Marks]**



B). Draw a solution state space tree to solve the following instance of the ***subsetsum*** problem using backtracking Set={3,5,7,10,12,15}, Sum=15 **[10 Marks]**

11. A). Explain the longest common subsequence problem with an example **[10 Marks]**
B). Explain the different types of data structures to represent the graph in computer memory with an example. **[10 Marks]**

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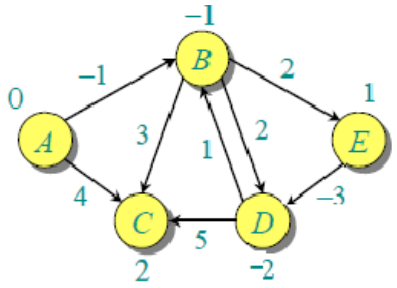
Section A: Answer the following questions and each question carries 5 Marks

[4x5=20 Marks]

1. Derive an alternate formula to find the N^{th} Fibonacci number
2. What is minimum cost spanning tree? List out any five differences between Prims and Kruskals Algorithm to construct the minimum cost spanning tree.
3. What are the differences between linear and binary search(at least five)
4. Write a quick sort best case, worst case and average case time complexity recurrence relation and give one input sequence for best case.

Section B: Answer the following questions

5. Find the shortest between all pair of vertices for the following graph using Bellman Ford Algorithm. **[10 Marks]**



6. Write an algorithm to implement the Activity selection problem and derive the time complexity expression. **[10 Marks]**
7. Find the optimal solution for the following instance of the knapsack problem using Greedy-designing technique; n=7, Profits={10,5,15,7,6,18,3}, Weights={20,30,25,15,10,10,20} and Maximum Knapsack capacity= 50 **[10 Marks]**

8. What is solution space tree? Draw the state space tree for the 4-queen problem using backtracking. **[10 Marks]**

Section C: Answer any two questions

9. A). Find the minimum number of scalar multiplication operation required to multiply the following matrix order using Dynamic Programming; m1=40x50, m2=50x16, m3=16x5 and m4=5x70 **[10 Marks]**
   B). What is an asymptotic? Explain the different types of asymptotic notations with an example **[10 Marks]**

10. A). Draw a solution space tree to solve the following travelling salesperson problem using Branch and Bound. Consider first vertex as the start vertex **[10 Marks]**

$$\begin{bmatrix} \infty & 10 & 15 & 20 \\ 5 & \infty & 9 & 10 \\ 6 & 13 & \infty & 12 \\ 8 & 8 & 9 & \infty \end{bmatrix}$$

   B). Explain the general steps to analyze the recursive algorithms? Describe the recurrence relation of merge sort? **[10 Marks]**

11. A). Explain the longest common subsequence problem with an example **[10 Marks]**
   B). Explain the different types of data structures to represent the graph in computer memory with an example. **[10 Marks]**