B.E. (Computer Engineering) Sixth Semester (C.B.S.)

Design & Analysis of Algorithms

P. Pages : 4 **TKN/KS/16/7504**

Time : Three Hours * 0 3 6 1 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain the concept of bounding summation using integration. **6**

b) Explain Logarithmic recurrences. Solve the following. **7**

$$T(n)=\begin{cases} 1 \text{ if } & n=1 \\ 3T(n/2)+n & \text{otherwise} \end{cases}$$

OR

2. a) Solve the given recurrence using recursion tree method **7**

$T(n)=3T(n/4)+\theta(n^2)$

b) Use Master method to give tight asymptotic bound for following recurrence. **6**

i) $T(n)=3T(n/4)+n\log n$ ii) $T(n)=T(\sqrt{n})+1$

3. a) What are different Asymptotic notations. Explain them briefly. Find upper bound, lower bound and tight bound range for following. **7**

i) $3n+2$ ii) $20n^2+8n+10$

b) What is amortized complexity ? Find potential candidates for 4-bit binary incrementor ranging from 0 to 8. **7**

OR

4. a) Give stepwise operation of Heap sort on following input array. **9**

$A=\langle 4, 8, 20, 17, 7, 25, 2, 13, 5\rangle$

Write algorithm and also explain the complexity of Heap sort algorithm.

b) Implement Bitonic sorting network for the following set of information. **5**

1, 5, 4, 8, 2, 3, 9, 7.

5. a) Write an algorithm to sort an array using Quicksort mehtod. Obtain its best case and worst case time complexity. **7**

b) Find out average no. of comparison required for successful and unsuccessful binary search on the following array. **6**
-12, 22, 34, 45, 56, 78, 91, 103, 114, 125, 156.

OR

6. a) What is minimum cost spanning tree. Find minimum cost spanning tree for the following graph using Prim's algorithm. **7**

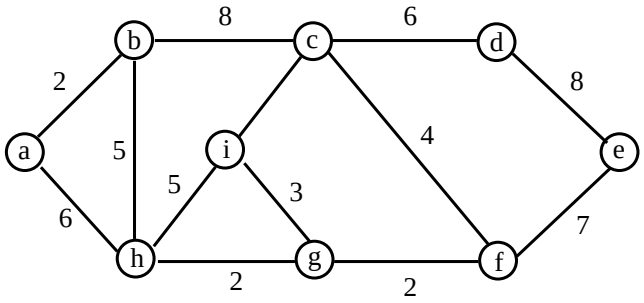

Fig. 6 (a)

b) What is the significance of Knapsack problem ? Implement three approaches on following objects and find out the profit value capacity = 30. No. of object = 07 **6**

Object :	1	2	3	4	5	6	7
Weight :	4	6	10	14	2	8	2
Profit :	20	15	20	28	8	18	6

7. a) Explain basic principle of Dynamic programming and principle of optimality. Also explain the difference between Dynamic Programming and Greedy algorithm. **6**

b) For the following multistage graph, obtain a recurrence relation for finding the shortest path from source vertex to destination vertex. Also explain the calculation for shortest path. **7**

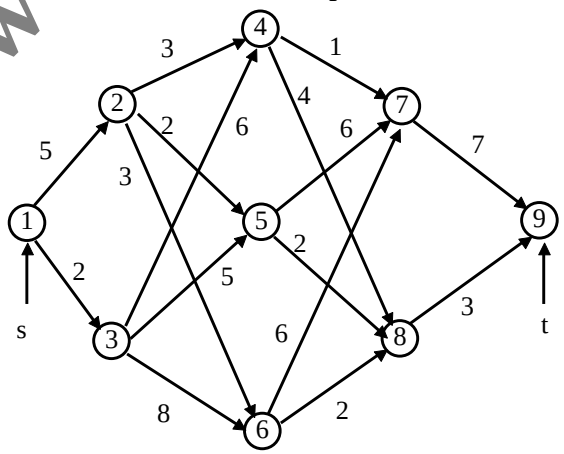

Fig. 7 (b)

OR

8. a) Find all pair shortest path using Floyd's Warshall algorithm for given directed graph. **7**

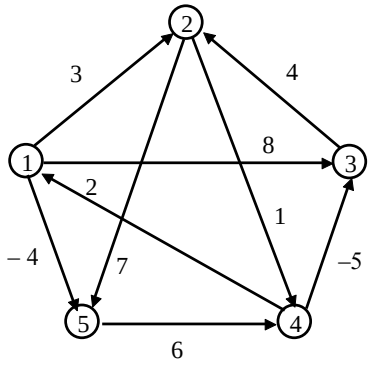

Fig. 8 (a)

b) Calculate the shortest path from source to destination in following travelling salesman problem. The distance matrix is as follows. **6**

$$\begin{bmatrix} 0 & 12 & 10 & 7 \\ 15 & 0 & 9 & 14 \\ 7 & 8 & 0 & 16 \\ 5 & 11 & 10 & 0 \end{bmatrix}$$

9. a) What is use of Hamilton cycles. Implement Hamilton cycle on following graph. **6**

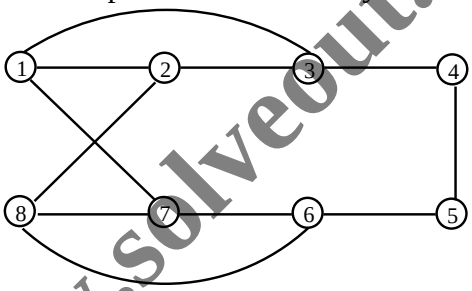

Fig. 9 (a)

b) Write an algorithm to solve 8-Queen problem. Explain implicit and explicit constraints associated with this problem. Give at least two solution for the problem. **7**

OR

10. a) Explain graph coloring method with an example. Give algorithm for it. **7**

b) Find out the articulation point in the following graph. Explain the procedure to find articulation point. **6**

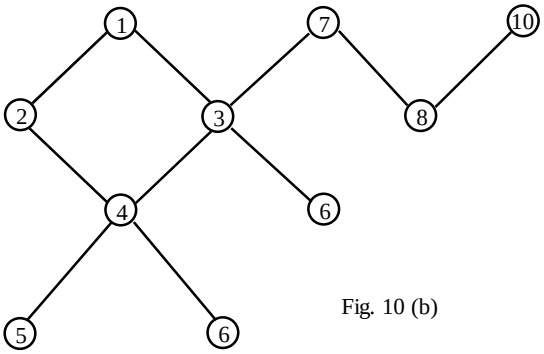

Fig. 10 (b)

11. a) Explain P, NP, NP – HARD and NP-Complete problems. **8**

b) Write algorithm for. **6**

i) Non-deterministic sorting

ii) Non-deterministic searching

OR

12. a) Explain the following NP-problems with respect to graph. **6**

i) CLIQUE

ii) Graph partitioned into triangle.

iii) Independent set problem.

b) Prove $P \subseteq NP$. **3**

c) How polynomial reduction can be used for showing NP-completeness of a problem. **5**

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