B.E. (Information Technology) Fifth Semester (C.B.S.)

Design & Analysis of Algorithms

P. Pages : 3 **NRJ/KW/17/4494**

Time : Three Hours 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. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Explain and solve following recurrence **8**

$$T(n) = T\left(\frac{n}{4}\right) + \sqrt{n} + 2 \;\forall\; n \geq 4$$

$$T(1) = 3$$

b) Solve **5**

$$t_n = \begin{cases} 2 & \text{if } n = 0 \\ 2t_{n-1} + 3^n + 2 & \text{otherwise} \end{cases}$$

OR

2. a) Solve **8**

$$t_n = \begin{cases} 1 & \text{if } n = 1 \\ 4T(n/2) + n\log_2^n & \text{if } n \text{ is power of } 2 \end{cases}$$

b) Define logarithmic recurrence with suitable example. **3**

c) Explain difference between recursion & iterative method of algorithm design. **2**

3. a) Define three Asymptotic notation. Find upper bound, lower bound and tight bound for the following. **6**

i) $3n + 7$

ii) $2n^2 + 8n + 10$

iii) $2^{5n} + n^2$

b) Explain three methods to implement amortized complexity. **7**

OR

4. a) Use master method to give Tight asymptotic bound for following recurrences. **4**

i) $T(n) = 4T\left(\frac{n}{2}\right) + n^2$

ii) $T(n) = 9T\left(\frac{n}{81}\right) + \log n$

b) What are three asymptotic notations? Explain the significance of each notation. **6**

c) Explain insertion sort and its complexity calculation. **3**

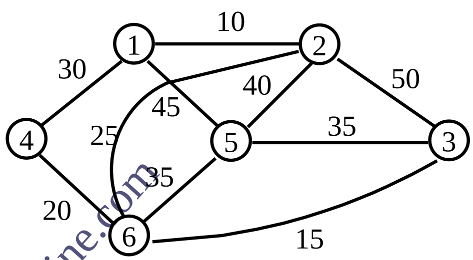
5. a) Explain the complexity of binary search. Implement binary search on following array and find avg number of comparison required for successful and unsuccessful search **7**
-12, -4, 9, 32, 50, 79, 109, 135, 203, 230.

b) Write an algorithm based on DAC approach to find minimum and maximum element from given array. Explain the complexity of algorithm. Implement the algorithm on following array and draw min-max tree. **7**
123, 82, 25, -20, -62, 43, 173, 95, 57, -45

OR

6. a) Find optimal solution to Knapsack instance n = 7 m = 15. **6**
(P1, P2 .... P7) = (15, 20, 10, 7, 6, 18, 3)
(w1, w2 ....w7) = (2, 3, 5, 7, 1, 4, 1)

b) Find minimum cost spanning tree using PRIM's algorithm. **8**



7. a) Using chained matrix multiplication method find out number of operation required to multiply following matrices also find the best sequence. **8**
A = 12x5 B = 5x45 C = 45x11 D = 11 x 10

b) Find LCS of following sequence: Also write algorithm for the same. **6**

x = a a b a a b a b a a

y = b a b a a b a b

OR

8. a) Implement travelling salesman problem for the graph represented by following matrix. **7**

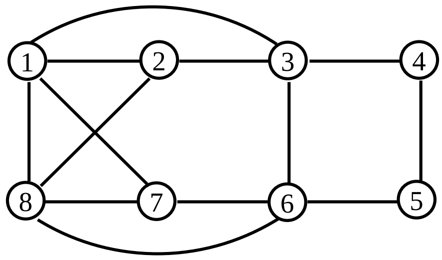
$$\begin{bmatrix} 0 & 15 & 13 & 9 \\ 7 & 0 & 10 & 14 \\ 5 & 12 & 0 & 11 \\ 6 & 16 & 8 & 0 \end{bmatrix}$$

b) Find cast and structure of OBST for n = 5 key and following probabilities. **7**

	0	1	2	3	4	5
p_i	-	0.15	0.10	0.05	0.10	0.20
q_i	0.05	0.10	0.05	0.05	0.05	0.10

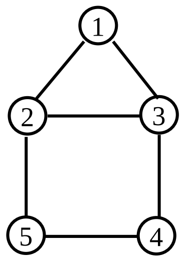
9. a) What is 8 Queen problem? Explain implicit and explicit constraints and draw at least two solutions for 8 queen problem. **7**

b) What is Hamiltonian cycle? Write Algorithm. Find Hamiltonian cycle for following graph. **6**



OR

10. a) What is a planer graph? Draw solution space tree to color the following graph using 3 colors. **7**



b) Explain sum of subset problem with example. **6**

11. Write a short note on solve **any three.** **13**

i) Graph partitioned into triangle.
ii) Independent set problem.
iii) Non deterministic searching.
iv) Non deterministic sorting.

OR

12. Explain solve **any four.** **13**

i) NP
ii) P
iii) NP-complete
iv) NP Hard
v) Polynomial Reduction
vi) Clique.

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