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> **IT'S HARD TO BEAT A PERSON WHO NEVER GIVES UP.**
>
> Babe Ruth, American professional baseball player

B.E. (Computer Science Engineering) Fifth Semester (C.B.S.)
Design & Analysis of Algorithms

P. Pages : 3   **NRJ/KW/17/4492**

Time : Three Hours | | | | | | | | | | | | | | *0415*   Max. Marks : 80

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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.

1. a) Solve the following recurrence   **7**
$T(n) = 3$ if $n = 0$

$= 2t_{n-1} + 2^n + 5$ otherwise

b) Explain principles of designing on algorithm in brief.   **6**

OR

2. a) Solve the following recurrence   **7**

$T(n) = T\left(\dfrac{n}{4}\right) + \sqrt{n} + 4$ for $n \geq 4$

$T(1) = 4$

b) Explain geometric & Harmonic series.   **6**

3. a) What are the different Asymptotic notations? Explain them briefly. Find upper bound, lower bound & tight bound for following.   **8**

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

b) Explain disjoint set representation. Where it is used? Explain with example.   **5**

OR

4. a) Explain all methods of Amortized Analysis for 4 – bit binary increment operation.   **6**

b) What is Bitonic sorter? Explain half cleaner circuit design 8 – bit bitonic sorting network for 1, 3, 5, 9, 8, 7, 4, 2.   **7**

5. a) Schedule the following Jobs using Job scheduling algorithm. Also write algorithm for the same.   **7**

Job	Profit	Deadline
1	10	2
2	50	1
3	9	2
4	26	3
5	18	2

b) Write an algorithm for Binary search. Find its complexity. Also find out average number of successful and unsuccessful comparisons on following array: **7**
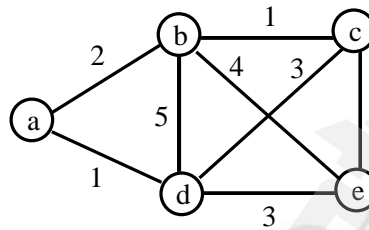-12, 23, 31, 45, 56, 78, 90, 103, 113, 126, 157

OR

6. a) For the following Knapsack sequence of objects find profit by three methods capacity = 30, Number of elements = 07. **7**

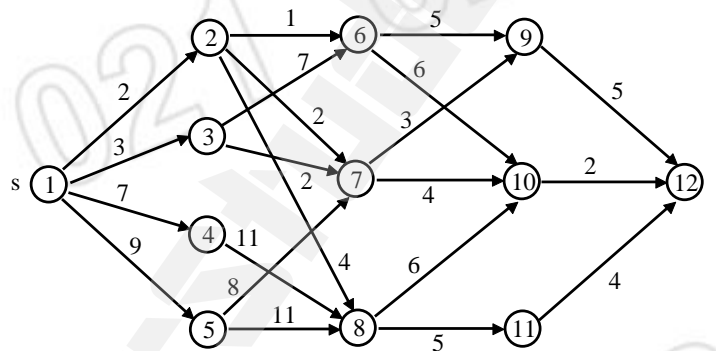| Object	1	2	3	4	5	6	7
Weight	4	6	10	14	2	8	2
Profit	20	15	20	28	8	18	6

b) Write KRUSKAL'S algorithm to generate spanning tree. Also implement the algorithm on following graph. **7**

7. a) For the following graph, find the shortest path from source 'S' to destination 't' using multistage graph algorithm. Also discuss its complexity. **7**
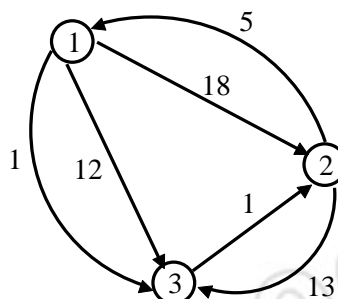

b) Determine LCS of **7**
    x = (e, x, p, o, n, e, n, t, i, a, l)
    y = (p, θ, l, y, n, o, m, i, a, ℓ)
by using Dynamic programming algorithm.

OR

8. a) Discuss Floyd-Warshall all pairs shortest path algorithm and generate the distance matrix for: **7**
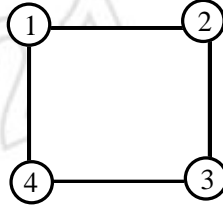
b) Determine cost and structure of an OBST for a set of n = 5 keys with the following probabilities. Draw the tree. **7**

i	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 graph coloring? Color the following graph using graph coloring algorithm. **6**

b) Explain 8 Queen problem. Explain the explicit & implicit constraints associated with this problem. Give at least two solutions for this problem. Write the algorithm. **7**
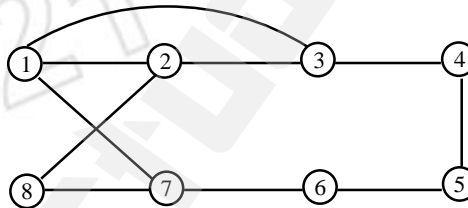
OR

10. a) Generate the space tree for following data using sum of subset problem. **6**

S = {10, 9, 15, 5, 1}

M = 25

b) What is Hamiltonian cycles? Implement it on following graph. Also find maximum cycles from graph. **7**

11. a) Explain following NP-problems with respect to graph. **6**
   i) CLIQUE
   ii) Independent set problem
   iii) Graph partitioned into triangle.

b) Prove $P \subseteq NP$ **4**

c) Write algorithm for Non-deterministic sorting. **3**

OR

12. Write short notes on: **13**
   i) P
   ii) NP
   iii) NP-Hard
   iv) NP-Complete problems.

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~ Babe Ruth