

N.B

- (1) Question no. 1 is compulsory.
- (2) Attempt any 3 from the remaining questions.
- (3) Assume suitable data if necessary.
- (4) Figures to right indicate full marks.

(3 Hours)

[Max Marks 80

Q1(a) Explain all cases of Master method. Solve following Recurrences using Master Method. 05

a. $T(n) = 4T(n/2) + n/\log n$

b. $T(n) = 3T(n/3) + n/2$

c. $T(n) = 6T(n/3) + n^2 \log n$

Q1(b) With a suitable example, explain the significance of the order of growth in analyzing the algorithm efficiency. 05

Q1(c) If $f(n)$ denotes the, number of moves in tower of Hanoi puzzle when n disks are involved, give a recurrence relation for $f(n)$ and solve this recurrence relation. 05

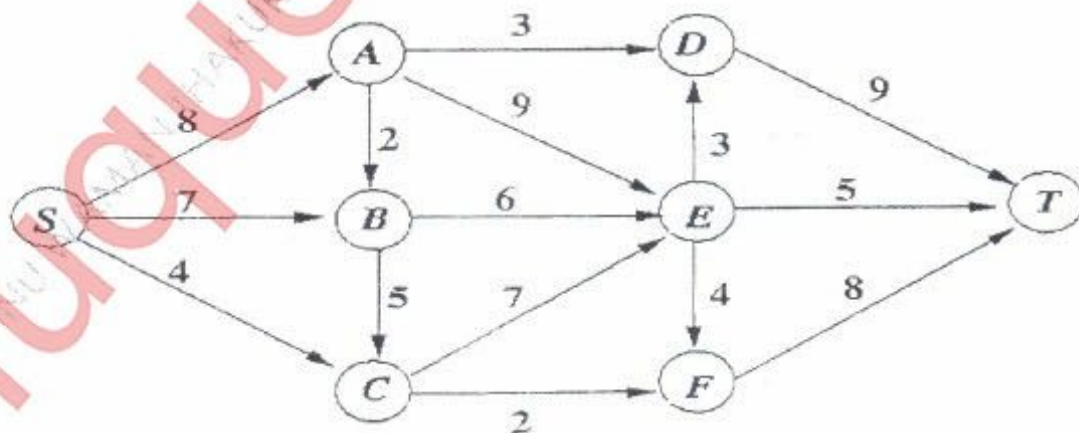
Q.1(d) Explain bipartite matching. 05

Q2(a) Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is $\langle 5,10,3,12,5,50,6 \rangle$ 12

Q.2(b) Explain Graham's algorithm to find convex hull. 8

Q3(a) What is red-black tree? Show the red-black tree that results from the successive insertion of the following keys 41,38,31,12,19,8 and the successive deletion of the following keys 8,12,19,31 10

Q3(b) Find maximum flow in the following flow network. 10



Q4(a) Explain Cutting Rod problem. Given a table of prices p_i determine the maximum revenue r_n obtainable by cutting the rod. 10

Len	1	2	3	4	5	6	7	8	9	10
Price	3	4	6	9	16	20	22	24	26	30

Q4(b) What is binomial heap? Explain its properties. Explain the operations that can be carried out on binomial heap with example. 10

Q5(a) Use Simplex method to maximize following objective function 12

$$z = 2x_1 - x_2 + 2x_3$$

Subject to the constraints

$$2x_1 + x_2 \leq 10$$

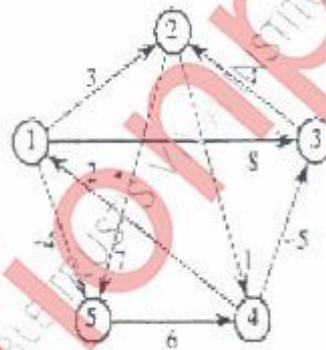
$$x_1 + 2x_2 - 2x_3 \leq 20$$

$$x_2 + 2x_3 \leq 5$$

where $x_1 \geq 0, x_2 \geq 0,$ and $x_3 \geq 0$

Q5(b) Explain Closest Pair of Points using divide and conquer. 8

Q6(a) Find all pair shortest path using Johnson's algorithm for the following graph 12



Q6(b) Explain Graham's algorithm to find convex hull. 8