

B.E. Comp. $\overline{\text{VII}}$
(3 Hours)

Q.P. Code : 811700

01.6.17
[Total Marks : 80]

- 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.

- 1 (a) Explain various asymptotic notations used to represent the rate of growth of running time of algorithms. 5
- 1 (b) Solve following Recurrences using Master Method. 5
- 1) $T(n) = 2T(n/2) + n^3$
 - 2) $T(n) = 3T(n/4) + n \log_2 n$
 - 3) $T(n) = 2T(n/2) + n / \log n$
 - 4) $T(n) = 16T(n/4) + n!$
 - 5) $T(n) = 0.5T(n/2) + 1/n$
- 1 (c) What is Binary Heap, Binomial tree, Binomial Heap? List properties of Binomial Heap. 5
- 1 (d) Compare Dynamic Programming and Divide and Conquer. Suggest the solution using both approaches for generating Fibonacci series. 5
- 2 (a) Explain Johnson's algorithm to find all pair shortest path with an example 10
- 2 (b) Explain maximum bipartite matching with an example. 10
- 3 (a) Explain Cutting Rod problem. Given a table of prices p_i determine the maximum revenue r_n obtainable by cutting the rod. 8

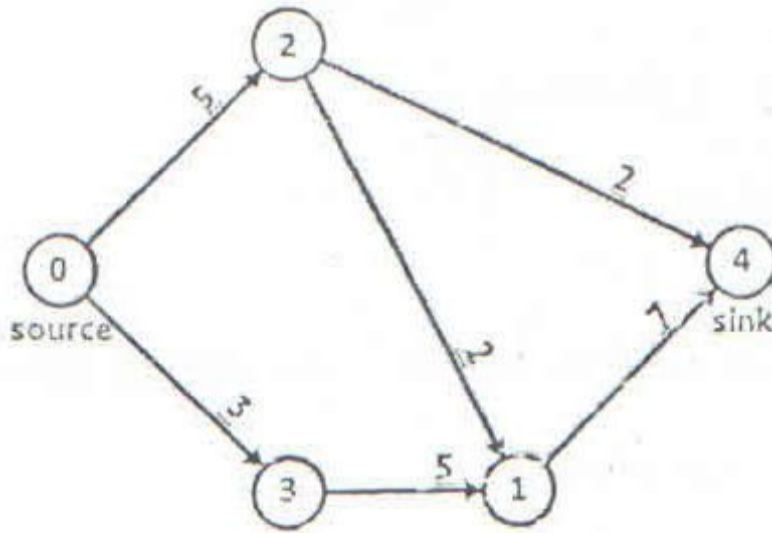
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|--------|---|---|---|----|----|----|
| Length | 0 | 1 | 2 | 3 | 4 | 5 |
| Price | 0 | 3 | 5 | 10 | 12 | 14 |

- 3 (b) Explain red black tree. Show the red-black tree that results after each of the integer keys 21, 32, 64, 75, and 15 are inserted, in that order, into an initially empty red-black tree. Delete keys 75 and 32 from the created tree. Clearly show the tree that results after each insertion and deletion (indicating the color of each node), and make clear any rotations that must be performed. 12

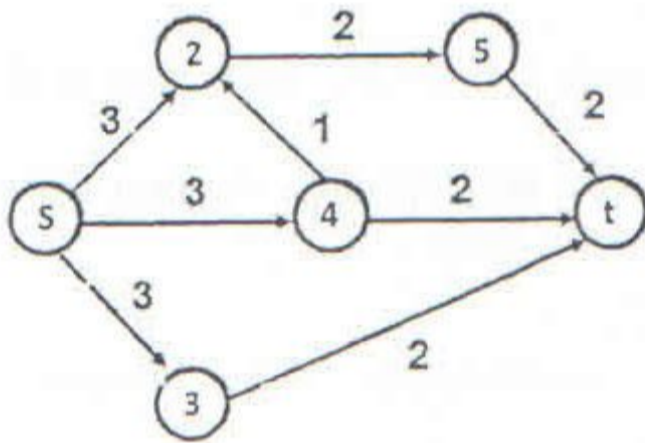
TURN OVER

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- 4 (a) Find a minimum cut in the following flow network. 10



- 4 (b) Find max flow using push-relabel algorithm. 10



- 5 (a) Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is $\langle 30, 35, 15, 5, 10, 20, 25 \rangle$ 12
- 5 (b) Explain Graham's algorithm to find convex hull. 8
- 6 (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 $X_1, X_2, X_3 \geq 0$
- 6 (b) Explain Closest Pair of Points using divide and conquer. 8