

Extra

N.B

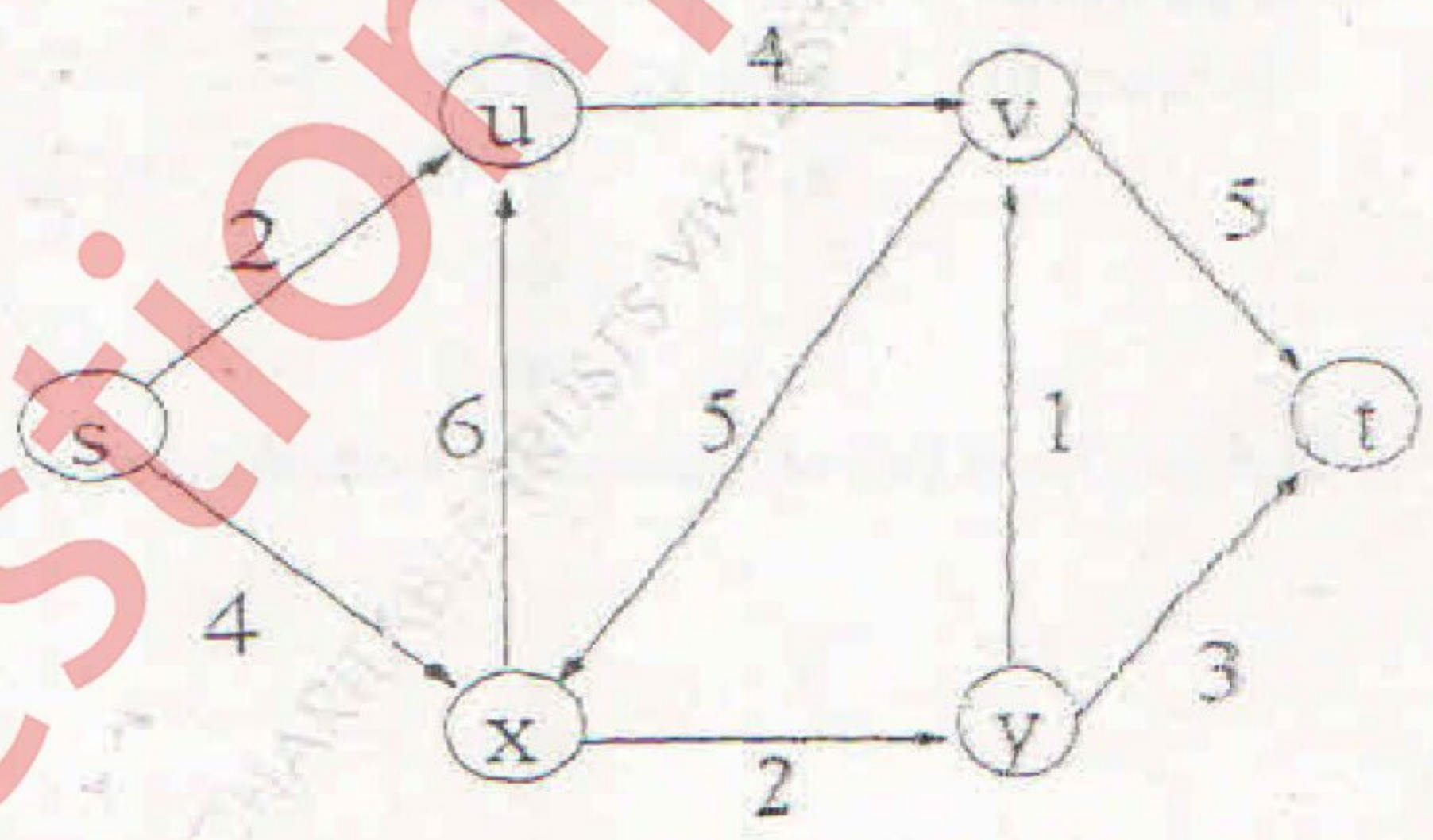
- (1) Question no. 1 is compulsory.
- (2) Attempt any 3 from the remaining questions.
- (3) Assume suitable data if necessary.
- (4) Figures to right indicate full marks.

- Q1(a) Explain all cases of Master method giving examples. 05
- Q1(b) Explain  $O, \Omega, \Theta, o, \omega$  notations with examples. 05
- Q1(c) Explain Line segment properties. 05
- Q.1(d) Write a recurrence for the running time of  $fun(n)$  and solve that recurrence. Assume that addition can be done in constant time. 05
- ```

fun(n)
{
  if (n == 1)
    return 1;
  else
    return f(n-1)+f(n-1);
}

```

- Q2(a) Explain push-relabel algorithm. Find max flow using the same algo. 12



- Q.2(b) Explain Graham's algorithm to find convex hull. 8
- Q3(a) Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is  $\langle 10, 15, 5, 10, 20 \rangle$  12
- Q3(b) Explain insertion in red-black tree with example. 8
- Q4(a) Find the shortest path from the node A(source) to all other nodes for the following weight matrix. 10

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|   |          |          |          |          |          |
|---|----------|----------|----------|----------|----------|
|   | A        | B        | C        | D        | E        |
| A | 0        | 5        | 8        | $\infty$ | 3        |
| B | $\infty$ | 0        | $\infty$ | 2        | 6        |
| C | 2        | 4        | 0        | 1        | $\infty$ |
| D | 2        | $\infty$ | 4        | 0        | $\infty$ |
| E | 1        | 2        | $\infty$ | 3        | 0        |

Q4(b) Let A=(7,2,4,17,1,11,6,8,15,10,20) 10  
 (i) Draw a binomial heap whose keys are elements of A  
 (ii) To a binomial Heap obtained this way, apply the operation remove\_min. Clearly show the resultant heap.

Q5(a) Explain with example maximum bipartite matching using ford-flukerson method, 10  
 Q5(b) 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 | 1 | 5 | 8 | 9 | 10 | 17 | 17 | 20 | 24 | 30 |

Q6(a) Solve the following linear program using simplex method 12  
 Maximize  $18x_1 + 12.5x_2$   
 Subject to  $x_1 + x_2 \leq 20$   
 $x_1 \leq 12$   
 $x_2 \leq 16$   
 $x_1, x_2 \geq 0$

Q6(b) Explain Closest Pair of Points using divide and conquer. 8