S.No. : 430

BCS 3602

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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33226 Roll No. [redacted]

B. Tech. Examination, 2024-25

(Even Semester)

DESIGN & ANALYSIS OF ALGORITHMS

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION – A

1. Attempt all parts of the following : 8×1=8

   (a) Explain different characteristics of an algorithm.

   (b) Explain different asymptotic notations.

   (c) Explain difference between greedy and dynamic approach.

   (d) Write three steps involved in divide and conquer aproach for problem solving.

   (e) Write down the best-case, worst case and average case-complexity of quicksort.

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(f) Explain flow networks.

(g) Explain two properties of binomial heap.

(h) Explain difference between BFS and DFS.

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

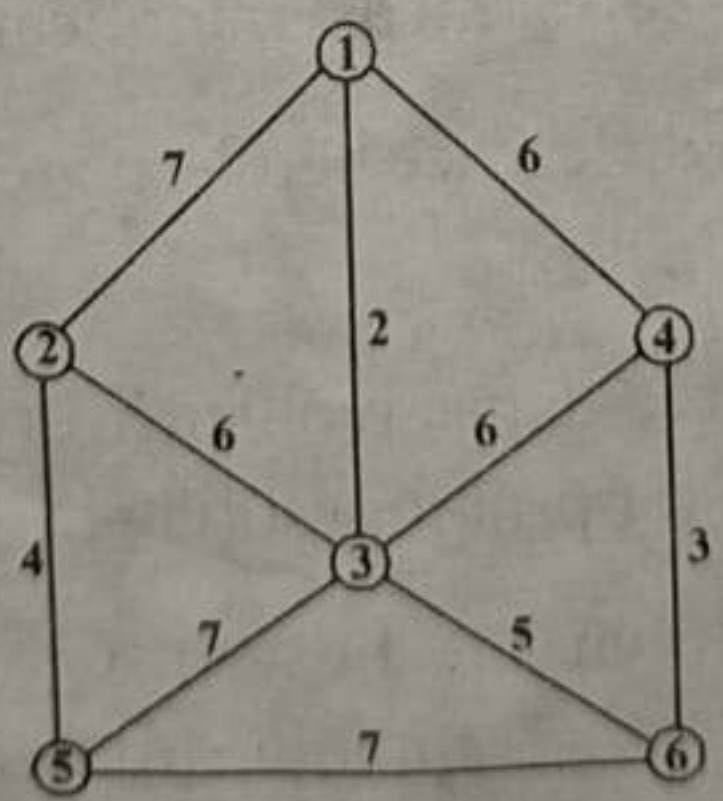
(a) Sort the given array by using merge sort algorithm :

<5, 2, 4, 7, 1, 3, 2, 6>

(b) Explain Naive string matching algorithm with example.

(c) Explain types of randomized algorithm with examples in detail.

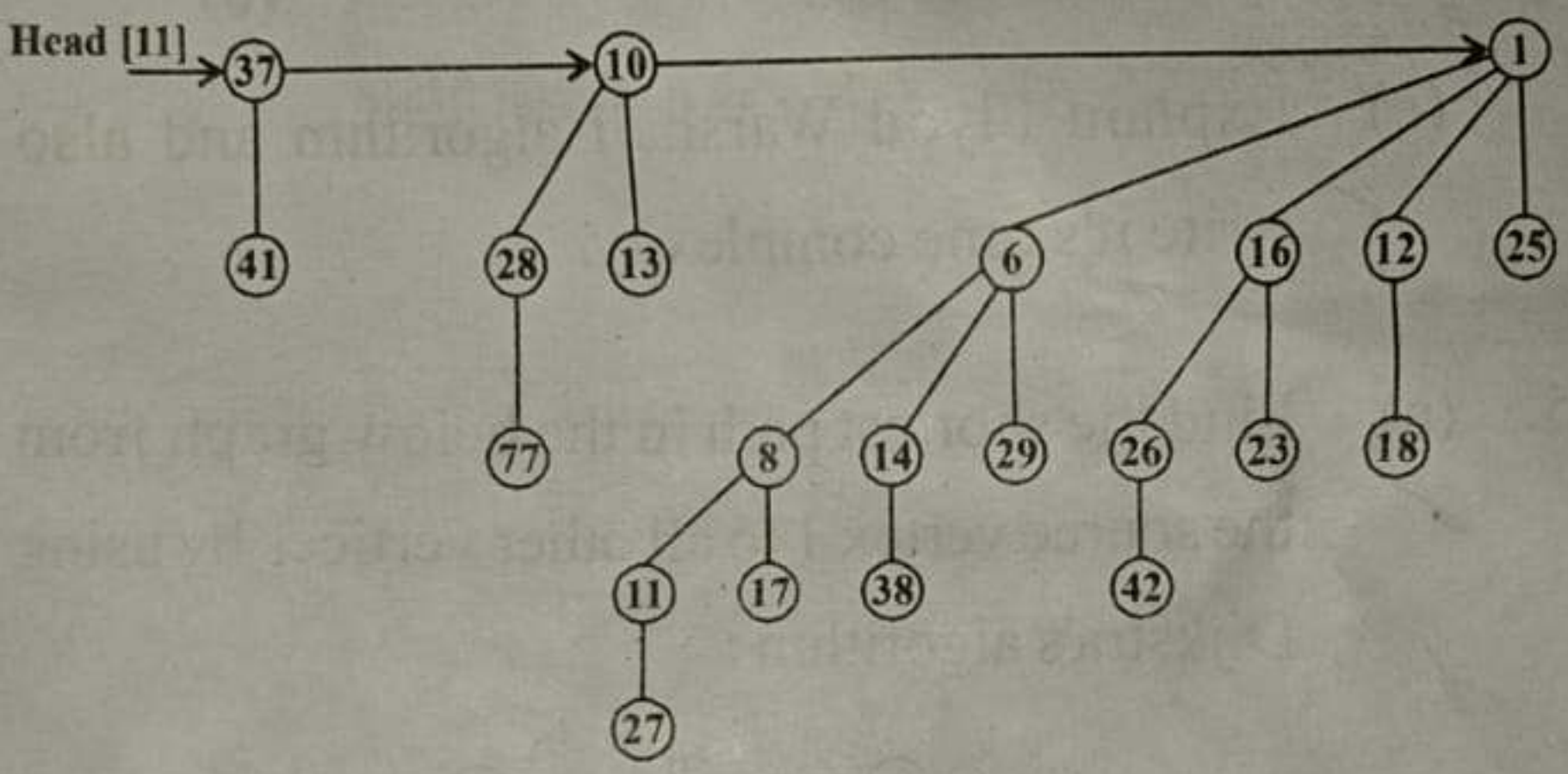
(d) Using Kruskal's algorithm find the minimum spanning tree of the following given graph :



SECTION – C

Note :– Attempt all questions. Attempt any two parts from each questions. 8×5=40

3. (a) Run the binomial-heap-extract-min procedure on the following binomial heap and give the resultant binomial heap :



(b) Explain in detail most common techniques used in amortized analysis.

(c) Consider following four matrices. Find optimal parenthesization of matrix chain multiplication:

Matrix	A_1	A_2	A_3	A_4
Order	20 × 30	30 × 50	50 × 10	10 × 5

4. (a) Explain quicksort algorithm and also write it's time and space complexity.

(b) Explain the following :

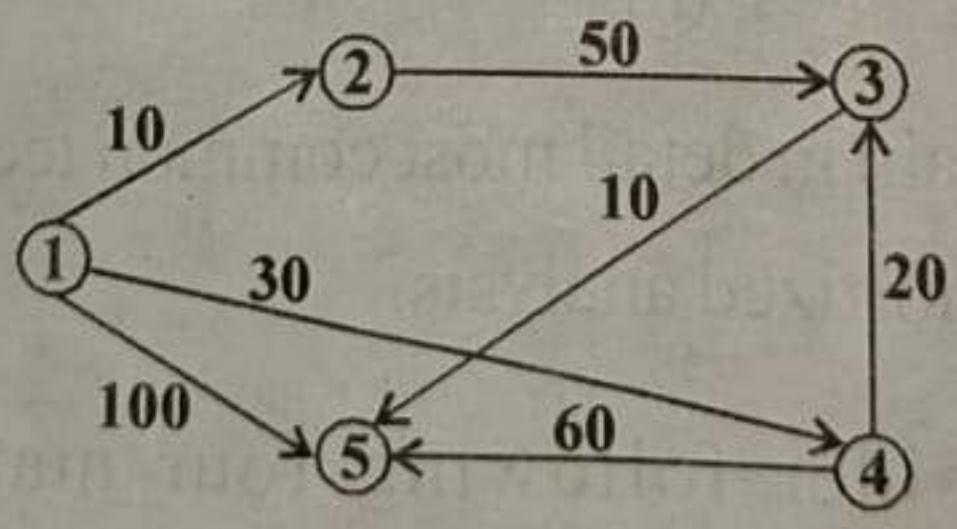
(i) P problem

(ii) NP problem

(ii) NP hard problem

(c) Explain Flyod Warshall algorithm and also write it's time complexity.

5. (a) Find the shortest path in the below graph from the source vertex 1 to all other vertices by using Dijkstra's algorithm :



(b) Explain depth first traversal method for graph with algorithm.

(c) Explain approximation algorithm and apply the same on travelling salesperson problem.

6. (a) Solve following recurrences using Master theorem :

(i) $T(n) = 2T\left(\frac{n}{2}\right) + n^3$

(ii) $T(n) = 16T\left(\frac{n}{4}\right) + n^2$

(b) Explain KMP string matching algorithm.

(c) Explain back tracking concept and draw the state space tree for 4 queens problem.

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