(7 pages)   Reg. No. : ....

Code No. : 5731   Sub. Code : ZCIM 12

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

First Semester

Computer Science with Artificial Intelligence

DESIGN AND ANALYSIS OF ALGORITHMS

(For those who joined in July 2022 onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Any data structure that supports the operations of search min (or max), insert and delete min (or max respectively) is called as ——————.
   (a) Graph
   (b) Priority queues
   (c) Both (a) and (b)
   (d) None

2. First In First Out : ——————
   (a) Dictionary   (b) Stack
   (c) Queue   (d) None

3. Quick sort has an average time of —————— on 'n' elements, its worst-case time is ——————.
   (a) $O(n^2)$ & $O(n \log n)$
   (b) $O(\log n)$ & $O(n)$
   (c) $O(n \log n)$ & $O(n^2)$
   (d) None

4. The —————— method leads to an elegant solution to the defective chessboard problem.
   (a) divide-and-conquer
   (b) lower bound
   (c) both (a) and (b)
   (d) none

5. The —————— algorithm generates optimal loadings.
   (a) Branch and Bound
   (b) Greedy
   (c) Non deterministic
   (d) None

6. Trees with edge weights are called ——————.
   (a) Weighted trees
   (b) Binary trees
   (c) Spanning trees
   (d) None

7. —————— is used to solve a problem with a multiplicative optimization function.
   (a) Greedy method
   (b) Spanning tree
   (c) Divide-and-conquer
   (d) Dynamic programming

8. A —————— graph $G = (V, E)$ is a directed graph in which the vertices are partitioned into $k \geq 2$ disjoint sets V_i $l \leq i \leq k$.
   (a) weighted   (b) multistage
   (c) both (a) and (b) (d) none

9. The m-colorability optimization problem asks for the smallest integer 'm' for which the graph G can be colored. This integer is referred to as the —————— number of the graph.
   (a) static   (b) dynamic
   (c) whole   (d) chromatic

10. A —————— is a round trip path along 'n' edges of G that visits every vertex once and returns to its starting position.
    (a) Multistage graph
    (b) Hamiltonian cycle
    (c) Both (a) and (b)
    (d) None

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Define Algorithm. What are the criteria all algorithms must satisfy?

    Or

    (b) Define Queue. Write a code for class definition for a queue.

12. (a) Give a brief note on Defective Chessboard.

    Or

    (b) Write down the code for Iterative binary search.

13. (a) Describe the usage of Huffman code.

Or

(b) What is Tree vertex splitting?

14. (a) Differentiate : Preemptive versus Non Preemptive scheduling.

Or

(b) What do you mean by Multistage graphs?

15. (a) Define Brute force approach and Back track algorithm.

Or

(b) Write short note on Hamiltonian cycles.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Define and explain the asymptotic notation Big oh, omega and Little omega.

Or

(b) Define Graph. How do you represent graph?

17. (a) How do you sort elements using Merge Sort?

Or

(b) How to find maximum and minimum items in a set of 'n' elements?

18. (a) Illustrate the usages and stages of Prim's algorithm for the following graph

Or

(b) How to solve Knapsack problem? Explain.

19. (a) Write down String Editing in detail.

Or

(b) With an algorithm, explain Depth first search.

20. (a) What is Sum of subset problem? How to solve sum of subsets problem?
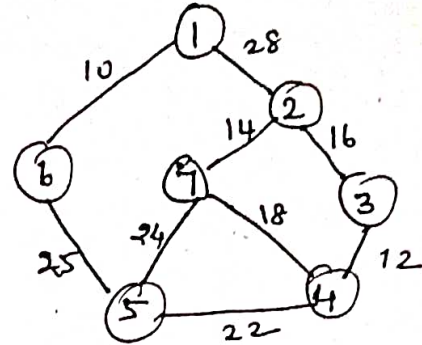
Or

(b) Discuss in detail about Graph coloring problem.

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