Hall Ticket No | | | | | | | | | | |

Question Paper Code:ACSC13

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR) - JULY 2022
Regulation:UG20
DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours **(CSE |CSE(AI&ML) | CSE(CS) | CSE(DS) | CSIT | IT) Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
(NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Explain the various asymptotic notations and compare asymptotic analysis with amortized analysis. [BL: Understand| CO: 1|Marks: 7]

   (b) Analyze the worst case and best case of the quicksort algorithm. Sort the following elements using quicksort
   38 08 16 06 79 57 24 56 02 58 04 70 45 [BL: Apply|| CO: 1|Marks: 7]

MODULE – II

2. (a) Define biconnected components and articulation points. Write an algorithm to find biconnected components. [BL: Understand| CO: 2|Marks: 7]

   (b) Explain DFS method. Apply DFS traversal on the graph given in Figure 1 and analyze the algorithm. [BL:Apply | CO: 2|Marks: 7]

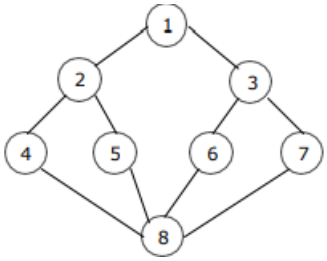

Figure 1

MODULE – III

3. (a) Write an algorithm to find the single source shortest path problem and demonstarte with an example. [BL: Understand| CO: 3|Marks: 7]

   (b) Considering the following graph given in Figure 2, find the minimum cost spanning tree using prim's algorithm. [BL: Apply|| CO: 3|Marks: 7]

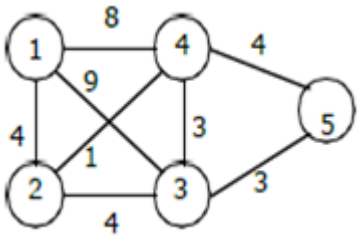

Figure 2

4. (a) Apply dynamic programming to obtain optimal binary search tree for the identifier set (a1, a2, a3, a4)=(cin, for, int, while) with (p1, p2, p3, p4)=(1, 4, 2, 1), (q0, q1, q2, q3, q4)=(4, 2, 4, 1, 1) and also write algorithm for its construction. [BL: Apply|| CO: 4|Marks: 7]

   (b) Solve the following instance of 0/1 Knapsack problem using Dynamic programming n = 3; (W1, W2, W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4. [BL: Apply|| CO: 4|Marks: 7]

MODULE – IV

5. (a) Briefly explain graph coloring problem with example. Write a program to illustrate the N queens problem. [BL: Understand| CO: 5|Marks: 7]

   (b) Describe sum of subset problem with example. Solve the following instance of the sum of subsets problem $S = \{5, 10, 12, 13, 15, 18\}$ and d=30. [BL: Apply|| CO: 5|Marks: 7]

6. (a) Relate Hamiltonian cycle with travelling sales person problem and also give the backtracking solution vector that finds all Hamiltonian cycles for any directed or undirected graph. [BL: Understand| CO: 5|Marks: 7]

   (b) Write and apply the backtracking algorithm to find chromatic number for the graph given in Figure 3 [BL: Apply| CO: 5|Marks: 7]

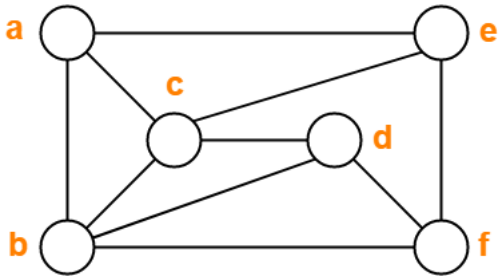

Figure 3

MODULE – V

7. (a) Discuss in detail about the class P, NP, NP-hard and NP-complete problems. [BL: Understand| CO: 6|Marks: 7]

   (b) Briefly discuss about Clique decision problem. Showthat Clique Decision problem is NP-Complete [BL: Apply| CO: 6|Marks: 7]

8. (a) State Cook's theorem and explain the proof in detail.. [BL: Understand| CO: 6|Marks: 7]

   (b) Compare deterministic and nondeterministic algorithm. Show that satisfiability of Boolean formula in 3 conjective normal form is NP-complete. [BL: Apply| CO: 6|Marks: 7]