

Time: 3 hours

Max. Marks: 80

- N.B. (1) Question one is Compulsory.**  
**(2) Attempt any 3 questions out of the remaining.**  
**(3) Assume suitable data if required.**

**Q. 1**

- a) Explain asymptotic notations. (05)
- b) Explain job sequencing with deadline with an example. (05)
- c) Write the algorithm and derive the complexity of binary search algorithm. (05)
- d) Definition of P, NP, NP-Hard, NP-Complete. (05)

**Q. 2**

- a) Explain 15-puzzle problem using branch and bound strategy. (10)
- b) Give the pseudo code for the KMP String Matching Algorithm. Use KMP algorithm to find pattern="ababada" in text="badbabababadaab". Show the prefix table and the valid shifts. (10)

**Q. 3**

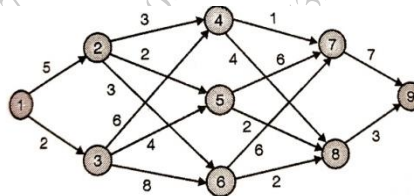
- a) Write algorithm for quick sort. Derive its time complexity. (10)
- b) Write Kruskal's algorithm for finding a minimum spanning tree. Explain its working with an example. Also compute the time complexity for the same. (10)

**Q. 4**

- a) Write algorithm for greedy knapsack and obtain the solution to following fractional greedy knapsack problem where  $n=5$ ,  $m=100$ ,  $(p_1, p_2, \dots, p_5) = (10, 20, 30, 40, 50)$  and  $(w_1, w_2, \dots, w_5) = (20, 30, 66, 40, 60)$  (10)
- b) Find Longest Common Subsequence for the following string  $X=xyzzyxy$  and  $Y=ytzxyx$  (10)

**Q. 5**

- a) Find minimum cost path from 1 to 9 for following multistage graph using dynamic programming. (10)



- b) Explain 8-Queen problem using backtracking. (10)

**Q. 6**

- a) Write the algorithm for insertion sort. Also sort the following numbers using same algorithm 11, 7, 17, 3, 9, 29, 85, 9 and show output after every pass. (10)
- b) Write the algorithm for 0/1 knapsack using dynamic programming. Also solve the following instance where  $M=21$ ,  $n=4$ ,  $(p_1, p_2, p_3, p_4) = (2, 5, 8, 1)$ ,  $(w_1, w_2, w_3, w_4) = (10, 15, 6, 9)$  (10)