

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2024****Subject Code:2150703****Date:16-05-2024****Subject Name:Analysis and Design of Algorithms****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1 (a)** Define the following terms: algorithm, set, function, relation, vector, matrix, linear inequality. **07**
- (b)** 1. State the general characteristics of the greedy method. **07**
2. State the general characteristic of the dynamic programming method.

- Q.2 (a)** Apply asymptotic notations to sequential search and binary search techniques and find their time complexities in best case, average case and worst case. **07**
- (b)** Solve the following recurrence relations. **07**
1. $T(n) = 2T(n/2) + n$
 2. $T(n) = T(n-1) + n$

OR

- (b)** Prove that Hamiltonian problem is NP-Complete problem. **07**
- Q.3 (a)** Solve sorting problem using divide and conquer strategy and show its working applying steps on the array [27, 45, 90, 12, 5, 60]. **07**
- (b)** Solve following knapsack problem using greedy method. Knapsack capacity = 60 kg. **07**

Item	Weight	Value
A	5	30
B	22	77
C	10	40
D	15	45

OR

- Q.3 (a)** 1. Illustrate the operation of BUILD-MAX-HEAP on the array $A = (5, 3, 17, 10, 84, 19, 6, 22, 9)$. **07**
2. Illustrate the operation of HEAPSORT on the array $A = (5, 13, 2, 25, 7, 17, 20, 8, 4)$.
- (b)** Explain how assembly line scheduling problem can be solved using dynamic programming method. **07**
- Q.4 (a)** Solve the following instance of making change problem using dynamic programming method. **07**
 $N = \text{Rs. } 8$, Coins: Rs. 1, Rs. 4, Rs. 6
- (b)** Write depth first search algorithm and show its execution on a sample graph. **07**

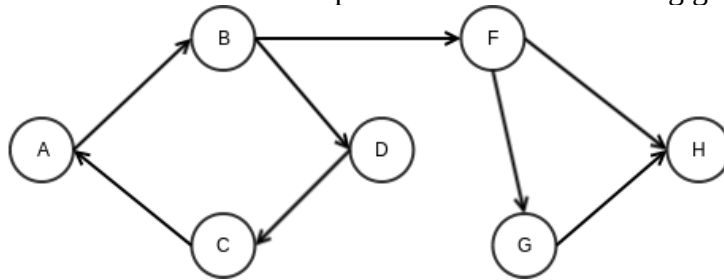
OR

- Q.4 (a)** Solve the following instance of making change problem using greedy method. **07**
 $N = \text{Rs. } 8$, Coins: Rs. 1, Rs. 4, Rs. 6
- (b)** Write breadth first search algorithm and show its execution on a sample graph. **07**
- Q.5 (a)** Apply and illustrate how 8-Queen problem can be solved using backtracking method. **07**

- (b) Write Naïve string matching algorithm. Apply it to the pattern $P = 0001$ and the text $T = 000010001010001$. Compute the number of comparisons required to find pattern P in the text T . **07**

OR

- Q.5 (a) Find all the connected components from the following graph. **07**



- (b) Define NP-Complete problem. Define class P and class NP. List the problems that fall under classes P, NP and NPC. **07**
