(i) Printed Pages : **4**] Roll No. .....

(ii) Questions : **9**] **Sub. Code : 3 6 0 8**

Exam. Code : 0 4 5 9

M.Sc. 1st Semester Examination

1127

INFORMATION TECHNOLOGY
(Computer Algorithms)
Paper : MS-62

Time : 3 Hours] **[Max. Marks : 80**

Note :– Attempt *five* questions in all, including question No. **1** in Section–A, which is compulsory and taking *one* each from Section–B to Section–E. Marks are indicated on the right of every questions.

Section–A

(Compulsory Question)

1. (a) What is a 'stack' data structure ? Give its applications.

   (b) What is a binary search tree ? Explain with the help of an example.

(c) What is time complexity of merge sort ?

(d) What is a minimum cost spanning tree ?

(e) How is recursive algorithm different from non-recursive algorithm ?

(f) What is a Hamiltonian cycle ?

(g) What is Clique decision problem ?

(h) State Cook's theorem. 8×2=16

Section–B

2. (a) Give applications of a Queue. Write a function for adding and removing element from a Queue.

(b) What is a graph ? Explain any *one* method to represent graphs. Give the non-recursive algorithm for the depth-first traversal of a graph. 8,8

3. (a) What is time and space complexity ? Give and explain a symptotic notations with suitable examples.

(b) What is a recurrence relation ? Solve the recurrence equation given below :

$$f(n) = f(n1) + f(n - 2)$$

$$f(0) = 0$$

$$f(1) = 1$$ 8,8

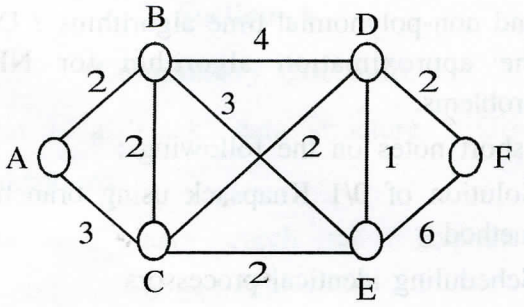
Section–C

4. (a) How is binary search different from linear search ? Write the binary search algorithm and compute its time complexity.

   (b) Show how array-based quick-sort-sorts the array, 5, 9, 7, 4, 0, 2, 8 and 8. Always choose the last key in an array (or sub-array) to be the pivot. Draw the array once for each swap. 8,8

5. (a) What is 0/1 Knapsack problem ? Describe, by giving an algorithm, how 0/1 Knapsack problem can be solved.

   (b) Using Dijkstra's algorithm, find the shortest path between A and F for the following graph. Show the intermediate steps also.



8,8

Section–D

6. What is dynamic programming ? Explain how using dynamic programming reduces the complexity of a simple algorithm. Explain the procedure to solve Travelling Sales Persons problem using dynamic programming approach. Comment on the nature of solution to the problem. 16

7. (a) Describe the Floyd-Warshall algorithm for finding the shortest path between all nodes in a graph.

   (b) Define Backtracking as a technique to solve problems with a large search space. Solve 8-queen's problem using backtracking. 8,8

Section–E

8. (a) What is non-deterministic algorithm ? Mention salient features of NP hard and NP complete classes. Discuss two examples for each case. Why are solutions to NP-complete problems difficult to find ?

   (b) What is the difference between polynomial time and non-polynomial time algorithms ? Describe the approximation algorithm for NP hard problems. 8,8

9. Write short notes on the following :

   (i) Solution of 0/1 Knapsack using branch-bound method

   (ii) Scheduling identical processors 8,8