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First Semester MCA Degree Examination, Jan./Feb. 2021 Data Structures with Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are data structures? Explain the classifications of data structures. (06 Marks)
- b. Define STACK. Write a C program to implement stack operations using arrays (by passing parameters). (08 Marks)
- c. Write a C program to convert infix to postfix expression. (06 Marks)

OR

- 2 a. Convert the following infix expression into postfix using application stack,
 $A + (B * C - (D / E ^ F) * G) * H$ (10 Marks)
- b. Implement a program in C for evaluating a postfix expression. (10 Marks)

Module-2

- 3 a. What is recursion? Write a program to implement tower of Hanoi problem using recursion and trace the output for 3 disks. (10 Marks)
- b. What is queue? Write algorithms for the primitive operations performed on queue. (10 Marks)

OR

- 4 a. Give the disadvantages of an ordinary queue and how it is solved in a circular queue? Write C program to implement circular queue. (10 Marks)
- b. What are priority queue? Write a program to simulate the working of priority queue. (10 Marks)

Module-3

- 5 a. Differentiate static versus dynamic memory allocation. How dynamic memory allocation is done in C? (10 Marks)
- b. Write C program to implement following operations on singly linked list :
(i) Insert a node at the end of the list.
(ii) Remove a node at end of list. (10 Marks)

OR

- 6 a. What are the limitations of array over linked lists? (10 Marks)
- b. Explain linked implementation of stack with suitable diagram. Also write algorithms to implement stack push and pop operation using singly linked lists. (10 Marks)

Module-4

- 7 a. Explain various steps in the fundamentals of algorithmic problem solving. (10 Marks)
- b. List out important problem types in the study of algorithms. Explain any two of them. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Define algorithm. Explain different asymptotic notations. (10 Marks)
 b. Show that if $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then,
 $t_1(n) \in t_2(n) \in O(\max(g_1(n), g_2(n)))$. (10 Marks)

Module-5

- 9 a. Write an algorithm to sort given 'n' element using bubble sort and find its time efficiency. (10 Marks)
 b. Write an algorithm to implement Brute Force's string matching process and apply the same for the given input.
 Text string = [Hello, How Are You?]
 Pattern string = [How] (10 Marks)

OR

- 10 a. Write an algorithm for selection sort and analyze. (10 Marks)
 b. Write DFS graph travels algorithm and write a trace for the following graph: (Refer Fig. Q10 (b)).

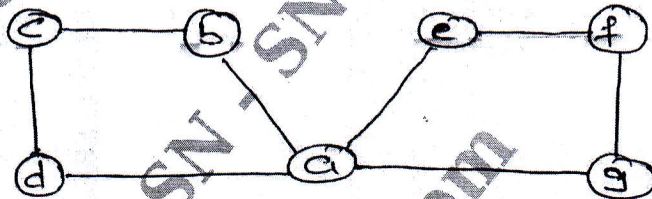


Fig. Q10 (b)

(10 Marks)