Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree (S,FE) Examination December 2020 (2015 Scheme)

Course Code: CS205

Course Name: DATA STUCTURES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 Give two methods through which the performance of an algorithm can be analysed. Use an example each to illustrate. (3)

2 What are the properties that an algorithm should have? (3)

3 What is an Abstract Data Type? What is its use? (3)

4 Illustrate how the polynomial $4x^3+11$ can be represented using an array and a linked list. (3)

PART B

Answer any two full questions, each carries 9 marks.

5 a) Calculate the total computation time for the following code and represent it using Big O notation (4.5)

```
c=0
for (k=1;k<=n;k*=2)
    for (j=1;j<=n;j++)
        c++
```

b) Given a pointer HEAD that points to the first element of a singly linked list, a value ITEM to be stored in the linked list and a value A after which ITEM is to be inserted, write an algorithm to insert ITEM to the list. (4.5)

6 a) Illustrate how step-wise refinement is used to arrive at a solution/algorithm to a problem, given a problem definition. (5)

b) A programmer needs to store the details of all students of a class of 60 students for an application he/she is developing. What data structure would be most appropriate? Provide appropriate justifications. (4)

7 a) What is the characteristic of a recursive algorithm? Write non-recursive version of binary search algorithm. (4)

b) Write an algorithm for multiplying two polynomials using linked lists (5)

PART C

Answer all questions, each carries 3 marks.

8		What are the limitations of array implementation of queue? Give two alternative representations of the same.	(3)
9		How are multiple stacks implemented? Illustrate.	(3)
10		Write an algorithm for substring search within a string.	(3)
11		How can a complete binary tree be represented using an array? Can a normal binary tree be represented using an array?	(3)

PART D

Answer any two full questions, each carries9 marks.

12	a)	Given five memory partitions of 300Kb, 700Kb, 400Kb, 500Kb, 800Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 412 Kb, 617 Kb, 112 Kb, and 626 Kb (in order)?	(4.5)
	b)	Write the algorithm for non-recursive pre-order traversal of a binary tree.	(4.5)
13	a)	Write an algorithm to convert a given infix expression to postfix Expression. Trace the steps involved in converting the given infix expression ((A +B)^C)-((D*C)/F) to postfix expression.	(6)
	b)	Write the algorithm for inserting an element to a circular queue.	(3)
14	a)	Given an infix expression (A +B)^C-(D*C)/F, convert into its prefix form.	(3)
	b)	Show the structure of the binary search tree after adding each of the following values in that order: 10, 25, 2, 4, 7, 13.	(6)
		(i) Illustrate how the element 2 can be deleted from the resultant tree.	
		(ii) What is the height of the final tree?	

PART E

Answer any four full questions, each carries 10 marks.

15	a)	Give two representations of graphs.	(4)
	b)	How can linear probing be used to resolve collisions? Explain with example.	(6)
16	a)	Construct a max heap with the following set of numbers entered sequentially. 10, 5, 14, 7, 12, 18, 15, 13	(5)
	b)	Write the algorithms for linear and binary search and compare their performances.	(5)
17	a)	What is a max heap? How can a heap be represented using an array?	(4)

18	a)	Write the algorithm for insertion sort. Analyse its performance for sorted input.	(4)
	b)	What are the limitations of linear probing? How can double hashing be used to resolve these limitations? Illustrate with examples.	(6)
19	a)	Write the algorithm for mergesort. Give its best and worst case performances.	(5)
	b)	What is open hashing? How is it used to resolve collisions in a hash table? Compare its performance with closed hashing.	(5)
20	a)	Write the algorithm for Quicksort. Analyse its worst case and best case performances.	(6)
	b)	Let the size of the hash table be 12. Consider the keys 43, 24, 57, 12, 10, 64, 19, 82, 36, 39 in the order. Show how the keys are occupied using chaining method.	(4)

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