2022

1st Semester Examination

MCA

Paper : MCA 103

(Data Structure and Algorithm)

Full Marks : 70 Time : Three Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

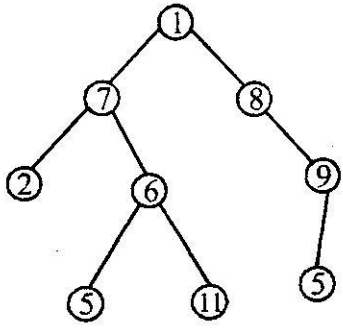
Group - A

Answer any ***five*** questions : 2×5=10

1. (i) Define complete binary tree with an example.

(ii) What are the important features of an algorithm?

(iii) Show the level order traversal of the following tree



P.T.O.

(iv) What do you mean by asymptotic analysis of an algorithm?

(v) How is a problem solved using branch and bound technique?

(vi) What is the necessity of approximation algorithm?

(vii) What do you mean by peep operation in a stack?

(viii) What are the advantages of linked list over array?

Group - B

Answer any ***four*** questions : 15×4=60

2. Convert the following infix expression into postfix expression. Show each step in detail.

$$(A+(B*C-(D/E\wedge F)+G)*H)$$

Write down the algorithm of quicksort. Explain why worst case time complexity of quicksort is more than the average case. 5+8+2

3. Explain operations on doubly linked list in detail with function for add and delete from doubly linked list. Why a tail recursive function is preferred to its non-tail recursive equivalent? What is threaded binary tree? Explain how a binary tree is transform into a threaded binary tree with an example. 7+3+2+3

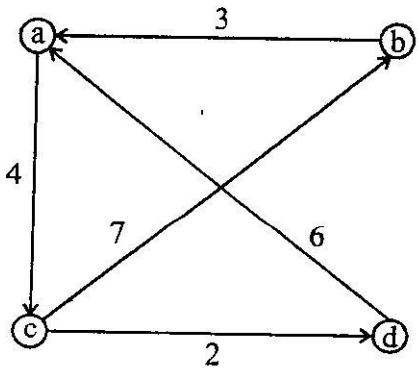
4. Write an algorithm to check wheather a given list is palindrome or not using stack. Explain dynamic programming approach using a suitable example. 8+7

5. Implement radix sort on the following numbers :

   23, 55, 29, 41, 36, 90 12 7+8

   Briefly explain how Kruskal's algorithm is used to find out the minimum spanning tree of a graph using a suitable example.

6. Derive the all-pair shortest path from the following graph by Floyd-Warshall algorithm using dynamic programming approach.



   Write short notes on : polynomial addition using array. 8+7

7. Derive the longest common subsequence from the string "BCDABC" and "CBADCA" using dynamic programming approach. What do you mean by sparse matrix? Why do we need different representation for sparse matrix. 10+3+2

P.T.O.

8. Explain greedy approach with a suitable example. What is the difference between performance analysis and performance measurement? How can we achieve performance analysis? 9+3+3

9. What do you mean by tractable problems? Define class P and class NP problems. What do you mean by reduction? When a problem is called a NP-complete problem? Define row-major and column-major representation of a matrix. 2+5+2+3+3

2022

1st Semester Examination

MCA

Paper : MCA 104

(Object Oriented Programming using Python)

Full Marks : 70 Time : Three Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group - A

Answer any ***five*** questions : 5×2=10

1. (a) Define a Class in Python with an example.

   (b) What is tuple? Give an example.

   (c) What are the rules for writing an identifier?

   (d) Distinguish between procedural and object-oriented programming.

   (e) What is property decorator?

   (f) What is dictionary in Python? Create a dictionary with Integer keys.

   (g) What is the function of _str_method?

   (h) What is operator overloading?

P.T.O.

Group - B

Answer any ***four*** questions : 15×4=60

2. (a) How can we define a function in Python? Explain with an example.

   (b) What is recursive function? Write a recursive function to find the GCD of two numbers.

   (c) What is tuple? Compare it with list and array. 3+7+5

3. (a) What is abstract class in Python? What is the necessity of using abstract base class?

   (b) How does Python check if a class is subclass of another? Explain with an example.

   (c) Does Python support multiple inheritance? 5+8+2

4. (a) Discuss different type of constructors in Python.

   (b) Describe default and parameterized constructors with examples in Python. 5+10

5. (a) What is polymorphism?

   (b) Write a user defined Python function to demonstrate Polymorphism.

   (c) Explain polymorphism with inheritance. 2+6+7

6. (a) Define inheritance. Explain it with an example in Python.

(b) State the advantages of inheritance in Python programming.

(c) Explain multiple and hierarchical inheritances with examples in Python. 3+2+10

7. (a) Write a program in Python to overload comparison operators.

(b) Distinguish between method overloading and method overriding with examples. 7+8

8. (a) What is the role of destructor? Which method is considered as the destructor method?

(b) Write a Python program to demonstrate the use of the destruct or method.

(c) Discuss with example any one situation where Destructor doesn't behave well. 3+5+7

9. (a) Define constructor. How can we declare it in Python?

(b) Write a program to search an element in an array using Linear search technique.

(c) Explain with an example how abstract base class work. 3+6+6

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2. Answer any ***four*** questions : 15×4=60

(a) What do you mean by the term "Software process model"? With the help of a diagram explain the activities carried out in the Prototyping model of software development. 3+12

(b) (i) Discuss the principle aim of Software Project Management.

(ii) Explain the major responsibilities of a software project manager.

(iii) Explain the term Project Planning. 8+4+3

(c) What are the popular metrics to measure project size? Explain any two of them. 3+12

(d) What are the different categories of software development projects according to the COCOMO estimation model? Explain in detail the basic COCOMO estimation technique. 5+10

(e) What do you understand by the term "Risk" and "Risk management"? Discuss briefly the activities of risk management. 3+12

(f) Define the term Cohesion and Coupling. Explain the different types of Cohesion and Coupling. 3+12

(g) What do you mean by Software Configuration and Software Configuration management? Explain the different activities of Software Configuration management. 3+12

(h) Write short notes : (i) SPMP document (ii) Types of Testing. (iii) Cyclomatic complexity. 5+5+5