

Exam. Code : 206702

Subject Code : 4102

**M.Sc. Computer Science 2nd Semester**  
**DESIGN AND ANALYSIS OF ALGORITHMS**  
**Paper—MCS-203**

Time Allowed—Three Hours] [Maximum Marks—100

**Note** :— There are **FOUR** Sections, each having **TWO** questions. Attempt any **FIVE** questions, selecting at least **ONE** from each section. All questions carry equal marks.

**SECTION—A**

1. (a) What is need of Algorithm ? What is difference between Algorithm and Pseudocode ? Write the features of algorithms.  
(b) How would you measure running time of Algorithm ? What is purpose of studying time/ space complexity ?
2. What do you mean by asymptotic notations ? Explain briefly Big O notation, Omega notation and Theta notation. Give example of each.

**SECTION—B**

3. What is divide and conquer strategy ? When it can be used ? Write some general characteristics of problem where this strategy does not fit ?

4. Apply merge sort algorithm on the array given below. Also find the time complexity using divide and conquer strategy. {310, 285, 179, 652, 351, 423, 861, 254, 450, 520}.

### SECTION—C

5. What is Knapsack problem ? What do you mean by Greedy method ? Write an algorithm to solve Single Source Shortest Path problem using greedy method.
6. What is spanning tree ? What is Minimum cost spanning tree ? Write the differences between Prim's and Kruskal's algorithm to find minimum cost spanning tree. Explain with an example.

### SECTION—D

7. Explain the advantages of using dynamic programming. Introduce travelling salesman problem. Explain the technique to solve travelling salesman problem using this technique.
8. Explain various searching techniques available for Tree and Graph data structures.

Exam. Code : 206702

Subject Code : 4622

M.Sc. (Computer Science) Semester—II  
MCS-204 : FORMAL SPECIFICATION AND  
VERIFICATION

Time Allowed—3 Hours] [Maximum Marks—100

**Note** :—(1) There are total **EIGHT** questions. Candidates are required to attempt any **FIVE** questions. All questions carry equal marks.

(2) The students can use only non-programmable and non-storage type calculator.

1. What is the role of formal specification languages ? Discuss the common features of formal specification languages. 20
2. Compare First Order Logic (FOL) with the propositional logic by discussing the pros and cons of FOL and propositional logic. Discuss the terms and predicates of FOL. What is universal and existential quantification ? 20
3. Discuss how Hoare logic can be extended to deal with the languages involving advanced constructs such as procedures with parameters, non-determinism, concurrency, communication and fairness. 20
4. What type of logical errors can occur in formal specifications ? Discuss any two techniques for detecting errors in formal specifications. What is the relationship (if any) between FOL and formal specifications ? 20

5. (a) What is Dijkstra's weakest pre-condition semantics ?  
What is strongest post-condition ?
- (b) What is the need of data refinements ? Discuss data refinement with the help of an example. 10+10
6. What are the safety and liveness properties ? How specification and verification of reactive programs is done ? 20
7. What is the use of deductive and model-theoretic approaches ? Explain these approaches. 20
8. Write short notes on the following :
  - (a) Hoare logic to prove correctness of factorial of number program
  - (b) Stack and Queue as abstract data types. 10+10

Exam. Code : 206702

Subject Code : 4100

M.Sc. Computer Science 2<sup>nd</sup> Semester

## MCS-201 THEORY OF COMPUTATION

Time Allowed—3 Hours] [Maximum Marks—100

**Note** :— Attempt **five** questions in all by selecting at least **one** question from each Section. All questions carry equal marks.

## SECTION—A

1. Explain normal forms of a CFG.
2. Describe regular expressions.

## SECTION—B

3. Design an automata for accepting strings generated over  $\Sigma = \{0, 1\}$  and starting with 1 and having 0 at the second position from the beginning.
4. Design a PDA for accepting following language :

$L = \{ww^T : w \in \{a, b\}^*, \text{ where } \Sigma = \{a, b\} \text{ and } w^T \text{ denotes reverse of } w\}$ .

## SECTION—C

5. Explain the concept of syntax analysis using any one high level language.
6. What are the formal properties of LL(k) grammars.

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**SECTION—D**

- 7. Describe context sensitivity.
- 8. Describe a rewriting system.

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**Paper—MCS-203**

Time Allowed—Three Hours] [Maximum Marks—100

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Exam. Code : 206702

Subject Code : 4104

M.Sc. Computer Science 2<sup>nd</sup> Semester  
DISTRIBUTED DATABASE SYSTEMS  
Paper—MCS-205

Time Allowed—3 Hours] [Maximum Marks—100

**Note :-** Attempt **five** questions in all. Select at least **one** question from each Section. The **fifth** question may be attempted from any Section.

**SECTION-A**

1. (a) What are the different types of schemas in distributed databases ? Explain. 10
- (b) Discuss various levels of transparencies in a distributed system. 10
2. (a) What is meant by transparency in a distributed system ? Explain the use of integrity constraints. 10
- (b) What is the need of fragmentation in distributed systems ? Explain. 10

**SECTION-B**

3. (a) Differentiate global query and local query. How a query can be applied on a fragment ? 10
- (b) How a Join and Union operation are used on a query in DDBMS ? Explain. 10

4. Explain the following :
- (a) Unary Tree in a query. 10
  - (b) Operations on query. 10

### SECTION-C

5. Discuss the following concepts by taking suitable examples :
- (a) Algebraic Operations for query optimisation. 10
  - (b) Relation Reduction using Semi Join. 10
6. Explain the following concepts :
- (a) Timestamping in distributed systems. 10
  - (b) Recovery mechanism in Transaction failure. 10

### SECTION-D

7. (a) What are two phase locking protocols ? Explain their use. 10
- (b) Explain the methods used for deadlock prevention in DDBMS. 10
8. Write notes on the following :
- (a) Reliability and concurrency control. 10
  - (b) Authorization in DDBMS. 10