2021

COMPUTER SCIENCE — GENERAL

Second Paper

Full Marks : 100

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.* 1** and ***any five*** from the rest, taking ***two*** from **Group-A**, ***one*** from **Group-B** and ***two*** from **Group-C**.

1. Answer ***any ten*** questions : 2×10

(a) Define a Complete Binary Tree.

(b) Differentiate between recursion and iteration.

(c) Convert the following infix expression to postfix notation (A + B) – C / D * (E + F).

(d) State any two properties of an algorithm.

(e) State the advantages of linked allocation.

(f) Write down the pre-condition of Binary search.

(g) Distinguish between DFD and flowchart.

(h) What is the purpose of SRS document?

(i) Write down any two limitations of waterfall model.

(j) Explain the term 'Transitive dependency'.

(k) Write down the two disadvantages of file management system over DBMS.

(l) What do you mean by data dictionary?

(m) Why is it necessary to normalize a database?

(n) Define instance of a database.

(o) Define primary key with an example.

Group - A

(Algorithm and Data Structure)

2. (a) Write an algorithm to compute the factorial of a number.

(b) Write the algorithm for insertion sort to arrange the elements in an array of integers in descending order.

(c) Define simple graph with an example.

(d) Distinguish between linear search and binary search. 4+6+2+4

3. (a) Define ADT with an example.

(b) Write an algorithm to delete a node after a given node in a single linked list.

(c) Construct a BST using the following nodes :

29, 1, 12, 25, 5, 36, 45, 72.

Show each intermediate step for construction. State the concept of construction. 4+6+(4+2)

4. (a) What do you mean by degree of a vertex in a graph? Illustrate with a suitable diagram.

(b) Write an algorithm for insert and delete operations of a queue represented by an array.

(c) Draw a flowchart to find the Fibonacci series up to 100. (2+2)+(3+3)+6

Group - B

(Software Engineering)

5. (a) Why is life cycle model important in software development?

(b) Discuss the spiral model for SDLC and mention its utility over waterfall model.

(c) Distinguish between physical and logical DFD. 2+(7+4)+3

6. (a) Why is software testing needed? Differentiate between black box testing and white box testing.

(b) Draw level-0 and level-1 DFD of a hospital management system. Make suitable assumption. (2+4)+10

Group - C

(Database Management System)

7. (a) What are the advantages of using Relational data model over Hierarchical data model?

(b) Discuss the importance of 'Functional Dependency' in database design through an example.

(c) What are the aggregate functions in SQL?

(d) How are data redundancy and data consistency controlled in DBMS? 4+4+4+4

8. (a) Give one example of DDL in context of SQL.

(b) Define foreign key and super key of a relation with suitable examples.

(c) Consider the relational schema having the following relations with their primary keys underlined :

Customer (cust_id , cust_name, annual_revenue, cust_type)

Shipment (s_no , cust_id, weight, truck_no, destination, ship_date)

Truck (t_no , driver_name)

City (city_name , population)

(i) Find the average weight of a shipment sent to highest populated city.

(ii) List the name and annual revenue of customers whose shipments have been delivered by truck driver 'Bimal'. 2+(3+3)+(4+4)

9. Write short notes on (***any four***) : 4×4

(a) ERD

(b) Network Data Model

(c) File Organization

(d) DBA

(e) Cartesian Product vs. Natural Join

(f) Normalization.