



বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.A./B.Sc./B.Com. Part-III (1+1+1) Examination 2020

3rd Year (Honours)

Subject: COMPUTER SCIENCE

Paper: VI

Full Marks: 80 (Theory)

Time: 4 Hours (Theory)

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

Questions are of equal value.

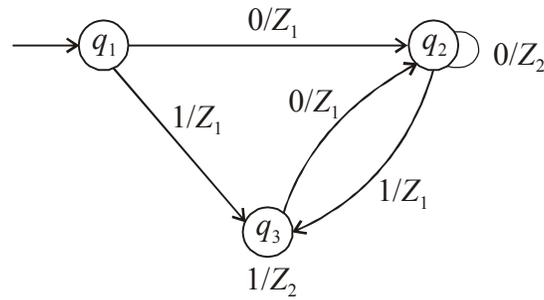
Answer any **one question** [within 250 words] from each Group.

Unit - I

Group A

(Fundamentals of Automata and Compiler Design)

1. What do you mean by finite state machine? Give an example. Define and compare Mealy and Moore machines. Convert the following Mealy machine into its equivalent Moore machine.



2. What is top down parsing? Prove that CFLs are not closed under intersection and complement operations. Minimize the following machine by determining the set of equivalent states.

Present State	Input = 0		Input = 1	
	Next State	Output	Next State	Output
A	E	1	C	0
B	C	0	A	0
C	B	0	G	0
D	G	0	A	0
E	F	1	B	0
F	E	1	D	0
G	D	0	G	0
H	F	1	B	0

3. What do you mean by grammar? With suitable example, define each set of grammar classified by Chomsky. Find the Context Free Grammar for the following language

$$L = \{a^n b^n c^i \mid n \geq 1, i \geq 0\}$$

4. List and describe all the phases of compilation process in sequence.

5. (a) Consider the following production rules:

$$S \rightarrow aBdh$$

$$B \rightarrow cC$$



$$C \rightarrow bC | \epsilon$$

$$D \rightarrow EF$$

$$E \rightarrow g | \epsilon$$

$$F \rightarrow f | \epsilon$$

Compute all the FIRST and FOLLOW sets.

(b) Check whether the given grammar is SLR(1) or not.

$$S \rightarrow Ax | bAC | dc | bda$$

$$A \rightarrow d$$

6. Write a brief note on runtime storage management.

7. (a) Define LL(1) grammar. Check if the following grammar is LL(1) or not.

$$A \rightarrow YaYb | ZbZa$$

$$Y \rightarrow \epsilon$$

$$Z \rightarrow \epsilon$$

(b) Discuss how finite automata is used to represent tokens and perform lexical analysis.

8. What are compiler construction tools? Explain its specification in details.

9. Describe the various error recovery strategies for a lexical analysis.

10. Construct the NFA corresponding to the regular expression: $(a + b)^* ab$. Find the equivalent DFA.

11. (a) Construct an FA accepting all strings w over $\{0, 1\}$ such that the number of 1's in w is odd.

(b) Construct a DFA accepting all strings over $\{a, b\}$ ending with ab .



(c) Consider the grammar G:

$$S \rightarrow aBa$$

$$B \rightarrow aBa|b$$

Find the language $L(G)$ accepted by the grammar.

12. Construct a grammar in Greibach normal form equivalent to the grammar:

$$S \rightarrow AA|a$$

$$A \rightarrow SS|b$$

Group B

(DBMS)

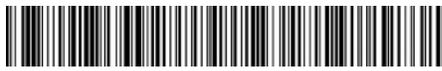
13. Describe the three tier architecture of the general DBMS in details.
14. Define the five basic operators of relational algebra with an example of each.
15. Briefly describe the concept of aggregation. Give two examples where aggregation is necessary.
16. Define DDL and DML. What is the need of query optimization? How it is achieved?
17. Mention some of the functionalities of a DBA. What do you mean by data anomaly? Describe Armstrong's axioms.
18. Explain the following: Theta Join, Equi Join, Natural Join, Inner Join
19. (a) Briefly describe partial functional dependency and full functional dependency.
(b) Consider a relation schema $R(A,B,C,D)$ with the following functional dependencies:

$$A \rightarrow B$$

$$B \rightarrow C$$

$$C \rightarrow D$$

$$D \rightarrow E$$



Determine whether the decomposition of R into R1 (A , B) , R2 (B , C) and R3 (B , D) is lossless or not.

20. How sequential approach is used for file organization in DBMS?
21. From the following information identify the entities and relationships and draw the E-R diagram. A university has a number of colleges under its jurisdiction. Each college has students and teachers. Teachers have certain qualifications and may have taught in other colleges. Some teachers have joint appointments and can teach in more than one college; however a student can attend only one college.
22. What is data model? Briefly describe hierarchical data model.
23. Why normalization is required? Describe several normal forms in DBMS.
24. Consider the following relations:

Customer (Cust_ID, Cust_Name, Address)

Loan (Loan_ID, Amount, Interest, Cust_ID)

Solve the following queries using SQL.

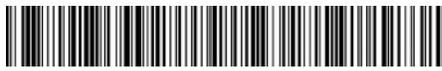
- (i) Display the name of the customer who has taken highest amount of loan.
- (ii) List the details of the customers who have not taken any loan.
- (iii) Find the total amount of loans provided to the customers in 'Midnapore'.
- (iv) Find the interest to be paid by the customer who has taken the minimum loan.

Unit - II

Group A

(Introduction to JAVA Programming)

1. Discuss about various OOP concepts in Java.
2. What is an array? Explain how one dimensional and multi-dimensional array are created and used in Java programming.



3. Discuss about method overloading and method overriding with suitable example. Write down the differences between them.
4. What is the use of this and final keywords in Java? Briefly explain with suitable examples.
5. Explain why static variable and static methods are used in Java? How they are different from their non-static variables and methods?
6. What is the need of super keyword? Discuss with examples about various situations where super keyword must be used.
7. What are packages? Explain with a suitable example how packages can be created and imported into a Java program.
8. Briefly explain the use of throw, throws, try, catch and finally keyword in exception handling in Java.
9. Discuss about the use of abstract class and interface in Java. Write down their differences.
10. What is a thread? Briefly explain with examples about various ways a thread can be created in Java.
11. Discuss about thread synchronization in Java with a suitable example.
12. What is an Applet? Write down the functionality of different methods of Applet class.

Group B

(Computer Graphics)

1. Discuss about the active and passive graphics devices and write down their difference.
2. Discuss the DDA line drawing algorithm in detail. Give its advantages and disadvantages.
3. Write down the Bresenham's line drawing algorithm and explain it with a suitable example.
4. Describe boundary fill algorithm for polygon with proper example.
5. Write down a circle generation algorithm and explain it with a suitable example.
6. Write down an ellipse generation algorithm and explain it with proper example.



7. Explain any line clipping algorithm with an example.
8. Define translation, rotation, and scaling with suitable examples.
9. Explain homogeneous coordinates and matrix representation in detail.
10. Define reflection and shearing with proper example.
11. Explain polygon clipping algorithm in detail with proper example.
12. Describe the flood fill algorithm for a polygon with a suitable example.

Vidyasagar University