MCA 2nd Lib

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MCAE/D-24 **24020**

PROGRAMMING IN JAVA

Paper–MCA–20–11

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Answer the following questions in brief : 6×2½=15

   (a) Write a short note on Java History.

   (b) How can you use Interface in Java?

   (c) What is a package in Java?

   (d) How can you stop and resume a thread in Java?

   (e) How can you create an executable applet in Java?

   (f) What is an adapter class in Java?

UNIT–I

2. (a) Explain various control structures in Java in detail. 7½

(b) Describe various Data types in Java. 7½

3. (a) Explain various types of inheritance in Java using suitable examples. 7½

(b) Write short notes on the following : 7½

(i) Garbage collection in Java.

(ii) JVM.

UNIT–II

4. (a) How can you add classes to a package? Explain using suitable examples. 7½

(b) What is meant by Wrapper classes? Explain using suitable examples. 7½

5. (a) How exceptions are handled in Java? Explain in detail using suitable examples. 7½

(b) Explain the working of the Java Thread Model in detail. 7½

UNIT–III

6. (a) Write a program in Java that reads the contents of a file encrypts them using any mechanism and stores the encrypted data to another file. 7½

(b) Discuss the various ways for I/O in applets in Java. 7½

7. (a) How can you pass parameters to an applet? Explain by writing a suitable program in Java. 7½

(b) Explain various methods in the Graphics class using suitable examples. 7½

UNIT–IV

8. (a) Explain the AWT class hierarchy in detail. 7½

(b) Write a program in Java to show the use of Border Layout. 7½

9. What are the various Event Listeners in Java? Explain by writing suitable programs. 15

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MCAE/D-24 **24021**

DATA STRUCTURES USING C++

Paper–MCA–20–12

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Answer the following questions in brief :

   (a) What is a Sparse matrix? How does it differ from a dense matrix?

   (b) What is the differences between a Singly linked list, Doubly linked list and Circular linked list?

   (c) What conditions must be satisfied for a binary tree to be a complete Binary tree?

   (d) Discuss the terms 'Simple graph', 'Multigraph', and 'Complete graph'.

UNIT–I

2. (a) Write a C++ program to implement Linear Search on an Integer array.

(b) What is Algorithmic complexity? Analyze the time complexity of Linear Search and Binary Search and explain the significance of the time complexity for large datasets.

3. (a) What is Encapsulation? Why is Encapsulation important when designing an Abstract Data Type (ADT)?

(b) How are Strings implemented in C++? Write a C++ program to perform a String concatenation operation

UNIT–II

4. (a) Describe how Polynomials can be represented using linked lists. What are the benefits of using a linked list over an array for this purpose?

(b) Outline the steps to implement a basic linked list structure in C++. Include key functions like insert, delete, and display.

5. (a) Write a C++ function that performs the push and pop operations in a stack implemented using an array.

(b) What is a Circular queue, and how does it differ from a regular queue? Discuss.

UNIT–III

6. (a) What is a Balanced tree? Why is Balancing important in Binary search trees?

(b) What is a Heap and what are the properties of a Max-heap and a Min-heap?

7. (a) Write C++ functions for In-order, Pre-order, and Post-order traversal of a Binary tree.

(b) Explain the Rotations (Left, right, Left-right, and Right-left) used to maintain balance in an AVL tree.

UNIT–IV

8. (a) Describe the adjacency matrix representation of a Graph. What are its advantages and disadvantages?

(b) Describe Dijkstra's algorithm for finding the shortest path from a single source to all other vertices.

9. (a) Describe Kruskal's algorithm for finding the MST.

(b) Explain the terms 'Vertex', 'Edge', 'Adjacency', 'Degree', 'Path', 'Cycle' and 'Connected graph'.

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MCAE/D-24 **24023**

DATA COMMUNICATION & COMPUTER NETWORKS

Paper–MCA–20–14

Time allowed : 3 Hours] [Max. Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Attempt all questions:

(i) What is Frame Relay and how does it differ from X.25? 3

(ii) Differentiate between asynchronous and synchronous transmission. 3

(iii) What is a Hybrid Fiber–Coaxial (HFC) network and how does it combine fiber and coaxial technologies? 3

(iv) Does the use of a wire center have any influence on the performance of a token ring? 3

(v) Compare datagram subnet and virtual circuit subnet. 3

UNIT–I

2. (a) What are the relevant design issues for a computer network? 7

   (b) How does a distributed network differ from a decentralised network in terms of architecture and control? Also discuss the advantages and disadvantages of centralised networking models compared to decentralised ones. 8

3. Sketch the layers of OSI and TCP/IP reference models and make a distinction between the two specifying distinctly the functions of each of the layers in both the models. 15

UNIT–II

4. (a) What is the importance of switching in data communication? Differentiate between circuit and packet switching. 9

   (b) What do you mean by multiplexing? Discuss various types of multiplexing. 6

5. (a) Distinguish between twisted pair cable, co–axial cable and optical fiber cable. 9

   (b) How is digital data transmitted through modems? How is modulation different from multiplexing? 6

UNIT–III

6. (a) Explain error–detection and correction. Give one example method for error detection and explain the importance of acknowledgment and sequence number in error control. 8

(b) Describe the hardware and software specifications of Ethernet and Token ring. 7

7. Which of CSMA protocols and ALOHA protocols is better in terms of occurrence of collisions? Explain slotted ALOHA, persistent and non-persistent CSMA protocols. 15

UNIT–IV

8. Discuss general principles of congestion control. Also explain the Leaky bucket and Token bucket algorithms for traffic shaping. 15

9. Differentiate between link state routing and distance vector routing. When are flooding and shortest path routing used in link state routing? 15

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MCAE/D-24 **24025**

COMPUTER FUNDAMENTALS AND PROBLEM SOLVING THROUGH C

Paper–MCA–23–11

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) Differentiate between Sequential access and Direct access storage devices.

   (b) What do you understand by Universal gates?

   (c) What is the difference between Break and Continue statements? Illustrate.

   (d) Differentiate between prefix and postfix ++ operators using suitable examples.

UNIT–I

2. (a) What do you understand by memory hierarchy? Discuss.

(b) What is an Operating system? Discuss in brief its important functions.

3. (a) What are the different symbols used in flow chart? Draw the flow chart to find the larges of three numbers.

(b) Draw the block diagram of a Computer system and discuss the functions of its different units.

UNIT–II

4. (a) Illustrate the process of grouping cells in a Karnaugh Map. Provide an example, and explain how grouping contributes to the simplification of a Boolean expression?

(b) What is 2's complement representation? How is it different from 1's complement representation? Discuss subtraction in 2's complement.

5. (a) Given the Boolean expression $XY + X'Z + YZ$, reduce it to its simplest form using Boolean algebra laws.

(b) Convert following decimal numbers to corresponding binary, octal and hexadecimal numbers :

(i) 129, (ii) 333.

UNIT–III

6. (a) What do you understand by Hierarchy and Associativity of Operators? Illustrate their use in evaluation of an expression.

(b) Discuss the Syntax and Semantic of switch statement using suitable example.

7. (a) What is the difference between while and do-while loop? Write the code to generate Fibonacci series using while as well as do-while loop.

(b) What are the different data types available in C ? Also discuss Enum and Typedef.

UNIT–IV

8. (a) What is Function in C? How is an array passed as an argument to a Function? Write a function that receives a 2-D array of integer as parameter and return its trace.

(b) What is Pointer? Discuss the sorting of names using array of Pointers.

9. (a) What is Recursion? Write a recursive function to perform binary search.

(b) What is Struct? How is it different from union? Illustrate.

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MCAQ/D-24 **24026**

COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

Paper–MCA–20–31

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Answer the following questions in brief : 5×3=15

   (a) What are levels of Parallelism? Explain.

   (b) Explain the difference between In-order and Out-of-order issues used in Superscalar processors.

   (c) Describe the Structure of a Star network, and explain its Strengths and Weaknesses.

   (d) Explain the differences between Write-through and Copy back Memory updation polices.

   (e) What is Chained Directory Scheme of Cache Coherence Protocol? Explain its working.

UNIT–I

2. (a) Define the Computational model and Computer Architecture. Explain the Relationships among Computational model, Computer architecture and Programming Languages. 7

   (b) What are true and false dependencies among instructions? Explain each with suitable examples. 8

3. (a) What is VLIW architecture? Explain characteristics and its working with suitable diagram. 7

   (b) How does Global scheduling differ from basic block scheduling? Explain the role of Global code motion in Global scheduling. 8

UNIT–II

4. (a) What is the role of Shelving in Superscalar architectures, and how does it affect instruction scheduling? Explain with a suitable diagram. 7

   (b) What mechanisms are used to preserve the Sequential consistency of Instruction execution in Superscalar processors? 8

5. (a) What are Branch penalties, and what techniques can be used to minimize them in Superscalar processors? 8

(b) What is three-bit branch prediction, and why is it more accurate than two-bit schemes? 7

UNIT–III

6. (a) What is a Uniform Memory Access (UMA) model, and how does it function in shared memory systems? 8

(b) What is a Barrel shifter in the context of interconnection networks, and how does it work? 7

7. (a) What is Network diameter? Compare the Network diameter of array, tree, ring, and 2D mesh topologies. 8

(b) What is distributed MIMD architecture? Explain its working and key characteristics with suitable diagram. 7

UNIT–IV

8. (a) Define the Locked, pended, and split transaction buses. Compare the read bandwidths of these buses with suitable diagrams. 8

(b) What is Arbiter logic? Explain working of daisy-chain Arbiter logic with suitable diagram. 7

9. (a) What are the Primary states in the Snoopy protocol? How does a Snoopy protocol manage these states? 7

(b) Explain the Routing mechanism in a Butterfly network. How do Data packets travel from source to destination through various stages? 8

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MCAQ/D-24 **24027**

DATA MINING AND INTEGRATION USING R

Paper–MCA–20–32

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Write short notes on the following : 15

   (a) Define the ETL process of Data warehouse?

   (b) How Data mining systems are classified according to the kind of knowledge mined?

   (c) Differentiate between different types of Hierarchical clustering.

   (d) Write the challenges behind implementing Nearest Neighbourhood.

   (e) Differentiate between Data warehouse and mediated schema. State an example.

(f) What are access pattern limitations? Elaborate.

(g) Write the R syntax to load a .CSV file. How do you find missing values in R?

(h) Differentiate between a vector and list in R.

UNIT–I

2. (a) Elaborate the Motivations behind data mining. How data mining is a step in the process of knowledge discovery? 8

(b) What kind of patterns can be mined using data mining functionalities? Is all patterns interesting? Comment. 7

3. What are the different forms of Data pre-processing? Why do we require it? Discuss the following : (i) Binning method for data smoothing, (ii) Attribute construction for data transformation, (iii) and Numerosity reduction. 15

UNIT–II

4. (a) What are the different types of Data in clustering? For the given data, compute two clusters using K-means algorithm for clustering where initial cluster centers are (1.0, 1.0) and (5.0, 7.0). Execute for two iterations. 8

Record Number	A	B
R1	1.0	1.0
R2	1.5	2.0
R3	3.0	4.0
R4	5.0	7.0
R5	3.5	5.0
R6	4.5	5.0
R7	3.5	4.5

(b) What is Tree pruning? Describe the essential features of decision trees in context of classification. How do you Compute the root of decision tree? 7

5. (a) Discuss the approaches for mining multi-level association rules from the transactional databases. Discuss about FP-growth algorithm for the following given example{M,O,N,K,E,Y} {D,O,N,K,E,Y} {M,A,K,E} {M,U,C,K,Y} {C,O,O,K,I,E}, Support = 60 %, Confidence = 80 %. 8

(b) What is the need of Neural Network? How do you compute neural network using AND gate? 7

UNIT–III

6. (a) Why is Data integration important? What are some common Data integration problems and how can they be addressed? 8

(b) Differentiate between set-based and sequence- based similarity measures? Computer the similarity between January and February using Needleman-Wunch measure. 7

7. (a) Differentiate between Schema matching and Schema mapping? Elaborate the challenges of schema matching and mapping system. 8

(b) Differentiate between Data matching and data mapping? How do you Compute data matching using learning based matching? State example. 7

UNIT–IV

8. (a) Write about data frame in R. Write about different operations on data frame with appropriate examples. 8

(b) How do we use control statements and loops in R? Explain with an example. 7

9. Write notes on the following :

(a) Data manipulation and integration in R. 8

(b) R packages associated with Decision Tree and Clustering. 7

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MCAQ/D-24 **24028**

ARTIFICIAL INTELLIGENCE

Paper–MCA–20–33

Time allowed : 3 Hours] [Max. Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Attempt all questions:

   (i) Define Artificial Intelligence and its application areas.

   (ii) What is the syntax and semantics of propositional logic?

   (iii) Differentiate between frames and scripts in knowledge representation.

   (iv) What is depth–first search? Write its merit and demerits.

   (v) State the properties of an admissible search algorithm.

UNIT–I

2. (a) Discuss the historical background and evolution of Artificial Intelligence.

(b) Explain the syntax, semantics and applications of First–Order Predicate Logic.

3. Explain the structured knowledge representation techniques using Script. How do scripts organise knowledge, and in what types of AI applications are these techniques particularly useful?

UNIT–II

4. (a) Describe the difference between uninformed search and informed search strategies.

   (b) Explain the working of the A* algorithm and discuss its properties of admissibility and monotonicity.

5. (a) Discuss Informed Search Algorithm and its application in game–playing scenarios.

   (b) Compare and contrast breadth–first search and depth–first search, highlighting their computational complexities.

UNIT–III

6. (a) What is a production system? Compare commutative and non–commutative production systems.

   (b) Discuss the architecture of rule–based expert systems.

7. (a) Explain how uncertainty is managed in expert systems.

   (b) Discuss the Dempster–Shafer theory for reasoning under uncertainty with an example.

UNIT–IV

8. (a) Explain the various types of learning in knowledge acquisition with examples.

   (b) Discuss the concept of learning by induction and its significance in Artificial Intelligence.

9. Describe the genetic algorithm process. Explain the role of selection, crossover and mutation operators in genetic algorithms.

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MCAE/D-24 **24030**

CYBER SECURITY

Paper–MCA–20–34(ii)

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) What is the difference between threat and attack? 3

   (b) Describe Human Based Social Engineering with a suitable example. 3

   (c) Define Cyber Stalking. 3

   (d) List some of the tips for Email security. 3

   (e) What is the principle of Port forwarding? 3

UNIT–I

2. (a) What are the characteristics of Cyber espionage? 7

   (b) What is Cyber terrorism? Describe the different methods used for Cyber terrorism. 8

3. (a) What is need for an International convention on cyberspace? 7

(b) Why India is not a part of Budapest treaty? 8

UNIT–II

4. (a) Discuss the tools used for gathering information about the target. 7

(b) Explain about Password cracking and Key loggers? 8

5. Describe cybercrime and the Indian ITA 2000. 15

UNIT–III

6. (a) Describe the term Cyber forensics and Digital Evidence? What are the precautions to be taken when collecting electronic evidence? 8

(b) Describe the various types of IPR. 7

7. Define the term Identity Theft. Explain types and techniques of ID Theft. 15

UNIT–IV

8. (a) What are the three modes of Snort? Explain. 8

(b) Explain the Working principle of VPN. 7

9. Write short notes on the following : 15

(i) NAT.

(ii) Linux firewall.

(iii) Stateful firewall.

(iv) Application of Blockchain technology.

(v) Packet Filter firewall.

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MCAQ/D-24 **24034**

PROGRAMMING IN KOTLIN

Paper–MCA–20–35 (iii)

Time allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting **one** question from each unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Attempt all questions:

   (i) What is the difference between val and var in Kotlin?

   (ii) What is the purpose of vararg parameters in Kotlin functions?

   (iii) What are sealed classes and how are they beneficial in Kotlin?

   (iv) How do you create a basic Activity with Kotlin in an Android app?

UNIT–I

2. (a) What is the difference between a generic array and an array of primitives in Kotlin?

   (b) What is the difference between a List and a Set in Kotlin?

3. (a) What is the purpose of the step function when using ranges in Kotlin?

(b) How does the Elvis operator (?:) work in Kotlin? Provide an example.

UNIT–II

4. (a) What is the when statement in Kotlin and how does it differ from a switch statement in other languages?

(b) Explain how you would pass a function reference as a parameter to another function in Kotlin.

5. (a) Explain how the repeat function works in Kotlin. How does the while loop differ from the do–while loop in Kotlin?

(b) What is an inline function in Kotlin and when would you use it?

UNIT–III

6. (a) What are the key differences between an abstract class and an interface in Kotlin?

(b) Explain the concept of coroutines in Kotlin and why they are used for asynchronous programming.

7. (a) What is the purpose of annotations in Kotlin and how do you define one?

(b) How do you mark a class or method in Kotlin to allow it to be overridden in a subclass?

UNIT–IV

8. (a) How do you throw a custom exception in Kotlin? Provide an example.

(b) What advantages does RecyclerView provide over ListView?

(a) In what situations would you prefer ConstraintLayout over LinearLayout or RelativeLayout?

(b) Explain the difference between explicit and implicit intents in Android. Provide an example of each.