MCA 1st / Lib

Roll No. ..... Total Pages : 03

CCAME/D-22 24020

PROGRAMMING IN JAVA

MCA-20-11

Time : Three Hours] [Maximum Marks : 75

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

1. Explain the following :
   (a) JVM
   (b) Garbage collection
   (c) Packages
   (d) Final and Finalize
   (e) Constructor and Destructor
   (f) Class and Interface
   (g) Local and Remote Applet.

Unit I

2. Differentiate C++ and Java. How JAVA is pure object oriented ? Write its various features. Discuss JVM.

3. (a) Write Java code to find the sum of 20 integers, entered through commend line argument.
   (b) Generate table of 9 through command line argument.

Unit II

4. What are different types of exceptions and their relative effects ? Write a program to handle your own exception.

5. Explain the concept of multithreading with java code. Explain creating, resuming and stopping threads in JAVA.

Unit III

6. Write Java code to read from text file and write into another text file using ByteStream and CharacterStream classes.

7. Explain Applet Life-cycle with suitable Java Program. Write applet code to draw Smiling Face using Applet graphics as shown.

Unit IV

8. Write Applet code to design calculator using Layout manager with proper working of Addition, Subtraction and Multiplication.

9. What are AWT Classes ? Explain various features of AWT classes in detail. Write Java Program to generate swap the contents of two text fields while pressing the button "SWAP".

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CCAME/D-22 24021

DATA STRUCTURES USING C++

MCA-20-12

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

Compulsory Question

1. (a) Compare bubble, selection and insertion sort on the basis of complexity.
   (b) Write an algorithm to traverse a singly linked list.
   (c) What is a complete binary tree ?
   (d) What is a spanning tree ?
   (e) When hashing should be used ? **5×3=15**

Unit I

2. (a) What is an Array ? Explain its memory representation along with various types. Also derive the formula for finding address of any element for various types of arrays. **7.5**

(b) What is a string ? Describe various ways to store string in computer memory. 7.5

3. (a) Write down algorithm/program in C++ to search an element from the given data using linear search and comment on its complexity. 7.5

(b) Write a program in C++ to check whether a pattern exists within a text or not. 7.5

Unit II

4. (a) How can you represent a polynomial using a linked list ? Explain how polynomial can be added using linked list by writing suitable algorithm. 7.5

(b) Write a program in C++ to delete an element at a specified location from a singly linked list. 7.5

5. What is a queue ? Explain various tyeps of queue along with their memory representation. Write and explain algorithms for inserting an element in all types of queues. 15

Unit III

6. (a) What is a threaded binary tree ? Explain its various types and memory representation in detail. 7.5

(b) Write an algorithm to search an element from a BST. 7.5

7. Write and explain the algorithm to sort the given data using heap sort. Also discuss the complexity of heap sort along with a suitable example. 15

Unit IV

8. (a) Write an algorithm to find the shortest path using Dijkstra's algorithm. 7.5

(b) Write an algorithm to find the minimum spanning tree using Prim's algorithm. 7.5

9. (a) Write and explain the algorithm for sorting the given data using radix sort. 7.5

(b) How collisions are handled in hashing ? Explain in detail. 7.5

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CCAME/D-22 24022

OPERATING SYSTEMS

MCA-20-13

Time : Three Hours] [Maximum Marks : 75

Note : Q. No. **1** is compulsory. In addition to that, attempt *four* more questions, selecting *one* question from each Unit. All questions carry equal marks.

(Compulsory Question)

1. (a) What is Process Control Block (PCB) ? Discuss various contents of PCB. **4**

(b) What is resource-allocation graph ? Explain using example. **4**

(c) What is file-system mounting ? What is the purpose of it ? **3**

(d) Discuss the token-passing approach for providing mutual exclusion in a distributed environment. **4**

Unit I

2. (a) Discuss the following : **9**

(i) Time-sharing systems

(ii) Clustered systems

(iii) Open-source operating systems.

(b) What are the activities of an operating system in regard to management of process, memory, file, secondary-storage and I/O System ? 6

3. (a) Explain SJF scheduling, Priority scheduling, Round Robin scheduling and Multi-level feedback queue scheduling along with their benefits and drawbacks. 10

(b) Discuss various states of process with diagram and various operations on processes. 5

Unit II

4. (a) What is critical section problem ? Explain the algorithms for solving critical section problem for two processes. 9

(b) What is dining-philosopher problem ? How can it be solved using semaphore ? Discuss. 6

5. (a) Discuss the Banker's algorithm for deadlock avoidance using suitable example. 9

(b) Discuss various methods for deadlock recovery. 6

Unit III

6. (a) Differentiate between the following using examples : 6

(i) Contiguous and non-contiguous allocation

(ii) Internal and External fragmentation.

(b) Explain various page replacement algorithms using examples. 9

7. (a) Discuss various file allocation methods. 7

(b) Discuss the following device scheduling algorithms and explain the criteria and situation where they will perform better : 8

(i) FCFS

(ii) C-SCAN

(iii) LOOK.

Unit IV

8. (a) Discuss the access matrix and its implementation. 9

(b) What is the security problem ? Discuss various methods of user authentication. 6

9. (a) Discuss various types of network-oriented operating systems along with their features. 7

(b) Briefly discuss the following in distributed file system : 8

(i) Remote file access

(ii) File replication.

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CCAME/D-22 24023

DATA COMMUNICATION AND COMPUTER NETWORKS

MCA-20-14

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. In addition to compulsory question, attempt *four* more questions selecting *one* question from each Unit. All questions carry equal marks.

Compulsory Question

1. Answer any *five* of the following questions in brief :

(i) List any three applications of Computer Network.

(ii) Depict diagrammatically the components of a LAN and how it can have access to the Internet.

(iii) What will be the maximum data rate for a 2 kHz noiseless channel with a support of 32 frequecny levels for the signal.

(iv) How is a virtual LAN different from a normal LAN ?

(v) How is framing done using physical layer coding violation ? Name one LAN standard that uses this framing technique.

(vi) Sketch the format of UDP datagram.

Unit I

2. Give a categorization of Computer networks according to size, purpose, transmission technology and design issues.

3. Sketch the TCP/IP reference architecture of the Internet and briefly mention the purpose of each of its protocols.

Unit II

4. Give a distinctive overview of Twisted Pair, Coaxial cables and Optical fibers along with the applications they are used for.

5. Bring out a comparison between the following :
   (a) Manchester, Differential Manchester and 4B/5B encoding
   (b) Circuit Switching, Virtual Circuit Switching and Datagram Switching.

Unit III

6. Describe, with illustrative examples, the two predominantly used error detection techniques at the transport layer and the data link layer of the network architecture.

7. Distinguish between :
   (a) GSM and CDMA
   (b) ALOHA and CSMA.

Unit IV

8. Describe flooding and shortest path routing along with their role in link state routing.

9. Give a descriptive comparison of the following :
   (a) IPv4 and IPv6
   (b) Choke packets and Load shedding.

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CCAME/D-22 24024

OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

MCA-20-15

Time : Three Hours] [Maximum Marks : 75

Note : Q. No. **1** is compulsory. In addition to that, attempt *four* more questions, selecting *one* question from each Unit. All questions carry equal marks.

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

(a) Differentiate among invariants, pre-condition and post-condition.

(b) What is Object ? Explain *four* characteristics of object.

(c) What is Actor ? Explain generalization relationship among actors.

(d) Explain association optimization with suitable examples.

(e) Distinguish between partition and layers.

Unit I

2. (a) Explain the term modularity and multilevel inheritance with examples. 7

(b) Explain the following in UML with examples : 8

(i) Active class

(ii) Component

(iii) Stereotypes

(iv) Adornments.

3. (a) Explain dependency and realization relationship in UML with two examples of each. 8

(b) What is deployment diagram ? Explain different elements of deployment diagram with an example. 7

Unit II

4. What is Association ? Explain the following about association with suitable examples : 15

role names, navigation, sequence, composition, qualified association, ternary association.

5. (a) Explain aggregate concurrency and concurrency within object in state modeling. 7

(b) What are limitations of one-shot state diagram ? Draw the nested state diagram for automatic transmission of a car. 8

Unit III

6. (a) What is sequence diagram ? Explain different elements of sequence diagram with suitable examples. 8

(b) What is usecase diagram ? Draw a usecase diagram for Banking System. 7

7. (a) What is activity diagram ? Explain concept of action nodes and swimlanes used in activity diagram with suitable example. 8

(b) Draw an activity diagram to send an SMS on mobile phone. 7

Unit IV

8. (a) Explain the following design decisions : 7
Setting trade-off priorities, handling boundary conditions, allocating tasks to processors.

(b) Explain the following class design activities : 8
Assigning operations to classes, design optimization.

9. (a) Explain different activities of application class model. 8

(b) Explain different activities of application interaction model. 7

MCA 3rd/Lib

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CMCA/D-22 24025

COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

MCA-20-31

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

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

(a) Explain the relationships between programming languages and parallel architectures.

(b) What are data parallel architectures ? Explain in brief.

(c) Define different metrics used to measure the peformance of interconnection networks.

(d) Differentiate between write-invalidate and write-update cache coherence policies.

(e) Discuss the emergence of superscalar processors in brief.

Unit I

2. (a) What is instruction level parallelism ? Explain data dependencies among instructions with suitable examples. **8**

   (b) What is instruction pipeline ? Discuss performance measures of pipeline processing. **7**

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

   (b) What is loop scheduling used in ILP processors ? Explain with an example. **8**

Unit II

4. (a) What is shelved issue ? How is it different from blocking issue ? Discuss different types of shelving buffers. **8**

   (b) Differentiate between aligned issue and unaligned issue with suitable diagram. **7**

5. (a) Discuss different static prediction schemes used in branch handling. **7**

   (b) What are branch penalties ? Discuss schemes to reduce them. **8**

Unit III

6. (a) What is UMA model ? What are limitations of UMA model ? How are these overcome by NUMA model ? Explain with suitable diagram. 8

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

7. What are direct interconnection networks ? Explain chordal ring of degree three, barrel shifter and hypercube of degree four with suitable diagram. 15

Unit IV

8. (a) What are locked, pended and split transaction buses ? Compare their read bandwidths. 7

   (b) What is butterfly network ? Explain the working of 8×8 butterfly network with suitable diagram. 8

9. (a) Define possible states of blocks in caches for snoopy protocol. Also define commands to be performed at various read/write, hit/miss actions. 8

   (b) What is full-map directory scheme ? What are its limitations ? How are these overcome by limited directory scheme ? 7

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CMCA/D-22 24026

DATA MINING AND INTEGRATION USING R

MCA-20-32

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* question each from Unit I to Unit IV. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) What is data warehouse ? Briefly discuss the characteristics of data warehouse.

(b) What are the different types of outliers ?

(c) Describe the structure of neural network.

(d) Write the challenges for implementing nearest neighborhood.

(e) Differentiate between Global-as-view and Local-as-view.

(f) Write a note on size filtering.

(g) Differentiate among vector, List, Matrix, and Data frame.

(h) How do you install a package in R ?

Unit I

2. (a) Define Data mining. Discuss the motivations behind data mining. How can you integrate data mining system with data warehouse architecture ? 8

   (b) Whether all patterns are interesting ? Explain data mining functionalities with appropriate examples. 7

3. What is data preprocessing ? Why do we need preprocessing ? Write a detailed note on data cleaning and data transformation. 15

Unit II

4. (a) What do you mean by clustering ? Discuss different types of hierarchical clustering. 8

   (b) Discuss the role of information gain to build a decision tree. How rules are generated in decision tree ? 7

5. Find all frequent itemsets for the following database using Apriori algorithm using candidate key generation. (Min_sup = 2) : 15

Tid	1	2	3	4	5	6	7	8
Items	1,5,6,8	2,4,8	4,5,7	3	5,6,7	2,3,4	2,6,7,9	5

Unit III

6. What is data integration ? Explain the architecture of data integration. Discuss similarity measure in string matching. 15

7. (a) What is schema matching and mapping ? Elaborate the challenges of schema matching and mapping. 8

(b) What is data matching ? Discuss rule based learning and learning based matching. 7

Unit IV

8. Discuss the features of R over other programming language. List and explain the functions used for data in data frames. 15

9. (a) Elaborate the issues in decision tree learning. Discuss about decision tree package in R. 8

(b) How do we use control statements in R ? Write a note on the package used for data visualization in R. 7

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CMCA/D-22 24027

ARTIFICIAL INTELLIGENCE

MCA-20-33

Time : Three Hours] [Maximum Marks : 75

Note : Q. No. **1** is compulsory. Attempt *four* more question selecting *one* question from each Unit. All questions carry equal marks.

(Compulsory Question)

1. Attempt any *five* of the following :

(a) Write a short note on Frame and Script.

(b) What are Inference Rules ? Explain them briefly.

(c) Explain the properties of Search Algorithm.

(d) Write briefly about fuzzy logic.

(e) Write about uncertainty of Expert System.

(f) Explain about Encoding schemes.

Unit I

2. (a) What is "Artificial Intelligence and Artificial Intelligence Technique" ? Briefly explain how AI technique can be represented and list out some of the task domain of AI.

(b) Write unification algorithm and explain resolution in predicate logic.

3. Discuss various approaches and issues in knowledge representation. Also discuss various problems in representing knowledge.

Unit II

4. Discuss the following search Technique with the help of an example. Also discuss the benefits and shortcoming of each :

   I. Breadth First Search.

   II. Depth First Search.

5. Explain the following search strategies and also explain their merits and demerits and even complexity :

   (a) steepest hill climbing

   (b) A* search.

Unit III

6. Explain Architecture of an Expert System. Give its three application areas.

7. (a) What is production system ? Explain it with an example. Discuss the characteristics of a production system.

   (b) Explain the Expert System Life Cycle. And also explain classes of Personnel involved in expert system development.

Unit IV

8. Explain the following :

   (a) Types of learning

   (b) Learning by automata

9. What is Genetic Algorithm ? Name and describe the main features of Genetic Algorithm and also explain about operators of GA.

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CMCA/D-22 24029

CYBER SECURITY

MCA-20-34 Opt. (ii)

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

Compulsory Question

1. (a) Differentiate between cyber crime and cyber fraud. 4

(b) Differentiate between active and passive attacks. 4

(c) What is Identity theft ? How can you prevent from being a victim of ID theft. 4

(d) How does a firewall protect a network ? 3

Unit I

2. (a) Discuss the following :

(i) Cyber terrorism

(ii) Cyber espionage. 7

(b) Discuss the challenges due to technological changes and the introduction of the Internet. 8

3. (a) Discuss various categories of cyber security. 9

(b) What is the need for a nodal authority for cyber security ? Discuss. 6

Unit II

4. (a) What is Attack Vector ? What are different attacks launched with attack vector ? Explain. 6

(b) Discuss the legal perspective of cyber crime including the Indian ITA 2000 and its amendments. Also give an overview of cyber crime scenario in India as well as overall global perspective. 9

5. (a) What are key loggers and spywares ? How key loggers can be used to commit a crime ? 7

(b) What is SQL Injection ? What are different countermeasures to prevent the attack ? 8

Unit III

6. (a) What is phishing ? Discuss the techniques used by phishers to launch phishing attacks. 7

(b) Discuss the myths and facts about Identity theft. Also discuss Personally Identifiable Information (PII). 8

7. (a) Discuss the digital forensics life-cycle. 8

(b) What are the ethical obligations in paralegal tasks in Intellectual Property Law ? Discuss. 7

Unit IV

8. (a) What is a firewall ? Describe the packet characteristics that need to be followed by packet filters and firewall. 7

(b) Explain the applications of block chain technology. 8

9. (a) Discuss the following :

(i) Virtual Private Networks

(ii) Windows Firewall. 10

(b) Briefly discuss the Snort Intrusion-Detection system. 5

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CMCA/D-22 24033

PROGRAMMING IN KOTLIN

MCA-20-35(iii)

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) What do you understand by null safety ? How is a variable declared nullable type ?

(b) How is type conversion performed in Kotlin ? Illustrate.

(c) What is the difference between structural equality (==) and referential equality (===) in Kotlin ?

(d) What is the use of throw keyword ? Illustrate.

Unit I

2. (a) How is a String declared and defined in Kotlin ? Discuss following with reference to String :

(i) String interpolation,

(ii) Looping through String.

(b) What is a map in Kotlin ? Can a map have two entries with same key ? Discuss.

3. (a) What is Set in Kotlin ? Discuss the following functions on Set : (i) isEmpty(), (ii) contains(), (iii) indexOf().

(b) What are the different data types available in Kotlin ? Discuss.

Unit II

4. (a) What do you understand by vararg and spread operators in Kotlin ? How do you pass the arguments to a function when vararg is not the last parameter ? Illustrate.

(b) What is the difference between break and continue statement ? Illustrate.

5. (a) Discuss the syntax and semantic of when statement using suitable example.

(b) What is Lambda ? How do you pass a lambda to a function ? Illustrate.

Unit IIII

6. (a) What is the difference between the final class and open class ? How is inheritance implemented in Kotlin ? Illustrate.

(b) What is a coroutine in Kotlin ? What is the need of them ? How are they different from threads in JAVA ? Discuss.

7. (a) Discuss the use of open, final and override keyword with respect to methods ? Use suitable examples.

(b) What do you understand by data class ? What are the essential requirements for data classes ? Illustrate.

Unit IV

8. (a) What do you understand by Exception ? Discuss the structure for exception handling in Kotlin. Use suitable example.

(b) What do you understand by intent in Android ? Discuss using an example.

9. (a) What is constraint layout ? How is it different from relative layout ? Discuss.

(b) What do you understand by fragment ? Explain using an example.