KANNUR UNIVERSITY

(Abstract)

New Generation course - Integrated M.Sc. in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme under CBCSS, offered at NAS College Kanhangad- Syllabus of 4th Semester Core Courses with Model Question Papers- Implemented w.e.f 2020 admission onwards- Orders issued.

ACADEMIC C SECTION

Acad/C2/16586/NGCI/2021 Dated: 17.03.2022

Read:-1. U.O Acad/C2/16586/NGCI/2021(I) dated 30.07.2021
2. U.O Acad/C2/16586/NGCI/2021 dated 18.08.2021
3. Syllabus of 4th Semester Core Course & Model Question Papers submitted by the Expert Committee Convener, dated 02.03.2022

ORDER

1. As per paper read (1 & 2) above, the syllabus of 1st, 2nd and 3rd Semester Core Course and Pattern of Question Papers of New Generation Course Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, was implemented.
2. As per paper read (3) above, the Convener, Expert Committee submitted the syllabus of 4th Semester Core Course & Model Question Papers of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme prepared by the Expert Committee.
3. The Vice-Chancellor, after considering matter in detail and in exercise of the power of Academic Council conferred under section 11(1) Chapter III of the Kannur University Act 1996, accorded sanction to implement the syllabus of 4th Semester Core Course & Model Question Paper of Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS) w.e.f 2020 admission, offered at Nehru Arts & Science College Kanhangad, subject to report the same to the Academic Council.
4. The 4th Semester Syllabus of Core Course & Model Question Papers for Integrated M.Sc.in Computer Science with Specialization in Artificial Intelligence and Machine Learning Programme (CBCSS), w.e.f 2020 admission are uploaded on the university website (www.kannuruniversity.ac.in).
5. U. O read (1) &(2) stands modified to this extent.

Orders are issued accordingly.

KANNUR UNIVERSITY
CIVIL STATION P.O.
KANNUR
Pin-670 002
THAVAKKARA

sd/-
BALACHANDRAN V K
DEPUTY REGISTRAR (ACAD)
For REGISTRAR

To: The Principal
Nehru Arts & Science College

Copy To: 1.The Examination Branch (PA to CE)
2. PS to VC/PA to PVC/PA to Registrar
3. DR/AR I Academic, EXCI
4.The Web Manager (for uploading in website)
5. SF/DF/FC

Forwarded / By Order

SECTION OFFICER

4B09ICSC: Computer Organization

Semester	Course Code	Hours per Week	Exam Hours
4	4B09ICSC	3	3

Course Outcome

CO 1: Understand the basics of digital electronics to design simple combinational logic and sequential logic circuits
CO 2: Understand the different design features of computer architecture
CO 3: Understand Processor logic design conventions and data path, pipelining and hazards, I/O organization, Interrupts and direct memory access
CO 4: Understand different types of memory and design techniques

Unit I

Logic Gates - AND, OR, NOT, NAND, NOR, XOR, Boolean Algebra - Basic Theorem and Properties, Boolean Functions, Standard Forms of Boolean Expressions - Sum of Products and Product of Sums, Boolean Expressions and Truth Tables, Minimization of Boolean Functions using Karnaugh Map Method - Basic Combinational Logic Circuits, Implementing Combinational Logic, Functions of Combinational Logic - Half Adder, Full Adder, Decoder, Encoder, Multiplexer, Demultiplexer.

(14 Hours)

Unit II

Sequential Circuit - Clocking, Flip Flops - SR, JK, D, T flip flops, Counters - Synchronous and Asynchronous counters, Up/Down Synchronous Counters, Registers - Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out and Parallel In Parallel Out Registers.

(14 Hours)

Unit III

Computer abstractions and technology - Introduction, Computer architecture -8 Design features, Application program - layers of abstraction, Five key components of a computer, Technologies for building processors and memory, Performance, Instruction set principles – Introduction, Classifying instruction set architectures, Memory addressing, Encoding an instruction set.
The Processor - Introduction, Logic design conventions, Building a datapath, A simple implementation scheme, An overview of pipelining - Pipelined datapath and control - Structural hazards - Data hazards - Control hazards

(14 Hours)

Unit IV

I/O Organization - Accessing I/O Devices, Interrupts - Handling Multiple Devices, Direct Memory Access, The Memory System – Basic concepts, Semiconductor RAM Memories - Internal Organization, SRAM, DRAM, Structure of Larger Memories, ROM Memories, Speed, Size and Cost, Cache Memory - Mapping Functions, Replacement Algorithms (LRU).

(12 Hours)

Text Books

[1] Floyd, T. L. (2017). Digital Fundamentals, 11th Edition. Pearson Education. (Unit I & II)

[2] Hennessy, J. L., Patterson, D. A. (2017). Computer Organization and Design MIPS Edition: The Hardware/Software Interface, *5th Edition*. Elsevier Science. (Unit III)

[3] Patterson, D. A., Hennessy, J. L. (2017). Computer Architecture: A Quantitative Approach, *6th Edition*. Elsevier Science. (Unit III)

[4] Zaky, S., Hamacher, C., Vranesic, Z. (2017). Computer Organization, *5th Edition*. McGraw-Hill. (Unit IV)

References

[1] Stallings, W. (2016). Computer Organization and Architecture: Designing for Performance, *10th Edition*. Pearson.

[2] Mano, M. M. (2016). Digital Logic and Computer Design. Pearson Education.

Marks Including Choice

Unit	Marks
I	16
II	16
III	16
IV	12

4B10ICSC: Database Management System

Semester	Course Code	Hours per Week	Exam Hours
4	4B10ICSC	3	3

Course Outcome

CO 1: Understand the structure and characteristics of database system
CO 2: Learn to design and query data using relational database management systems.
CO 3: Understand the concepts of database normalization
CO 4: Understand the basic concepts of transaction management and concurrency control
CO 5: Understand the basic concepts of NoSQL databases

Unit I

Introduction to Database and Database Management System - Evolution, Advantages, Applications, Overview of DBMS, Concept of Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages (DDL and DML), Database Users, DBA, Centralized and Client/Server Architecture for DBMS.
Entity relationship model - Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles, Structural Constraints, Weak Entity Types, ER Diagram, Specialization and Generalization.

(14 Hours)

Unit II

Relational Data Model - Concepts, Relational Data Model Constraints and Schemas. Structured Query Language - Data Types, Data Definition, DDL statements - CREATE, ALTER, DROP, Specifying Constraints in SQL, DML Statements - INSERT, UPDATE, DELETE, SELECT, DCL Statements - GRANT and REVOKE, Joins in SQL, Aggregate Functions in SQL, GROUP BY and HAVING Clauses, Views, Indexes in SQL - Motivation, Declaration, Selection of Indexes.
Relational Algebra - Select, Project, Rename, Union, Intersection, Minus, Set Operations, Cartesian Product, Join, Equi Join and Natural Join.

(14 Hours)

Unit III

Functional Dependencies, Normal Forms - 1NF, 2NF, 3NF, BCNF, Multivalued Dependencies, 4NF.
Transaction Processing - Need for Concurrency Control, Transaction States, System Log, Commit Point, ACID Properties of Transactions, Schedules of Transactions, Characterizing Schedules Based on Recoverability and Serializability, Testing for Serializability, Two-phase Locking Techniques for Concurrency Control.

(14 Hours)

Unit IV

Introduction to NoSQL databases, Characteristics of NoSQL Databases, Overview of Document-Based NoSQL Systems and MongoDB, Overview of NoSQL Key-Value Stores, Overview of Column Based NoSQL Systems, Overview of NoSQL Graph Databases and Neo4j.

(12 Hours)

Text Books

[1] Navathe, S., Elmasri, R. (2017). *Fundamentals of database systems*, *7th Edition*, Pearson Education.

[2] Sudarshan, S., Silberschatz, A., Korth, H. F. (2019). *Database System Concepts, 7th Edition*. McGraw-Hill.

References

[1] Ullman, J. D., Garcia-Molina, H., Widom, J. (2014). *Database Systems: The Complete Book, 2nd Edition*. Pearson Education.

[2] Ramakrishnan, R., Gehrke, J. (2000). *Database Management Systems, 3rd Edition*, McGraw-Hill.

[3] Ramesh, V., Hoffer, J. A., Topi, H. (2018). *Modern Database Management, 12th Edition*, Pearson Education.

[4] Begg, C., Connolly, T. (2020). D*atabase Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition,* Pearson Education.

Marks Including Choice

Unit	Marks
I	16
II	16
III	16
IV	12

4B11ICSC: Object Oriented Programming using Java

Semester	Course Code	Hours per Week	Exam Hours
4	4B11ICSC	4	3

Course Outcome

CO 1: Understand the concepts of object oriented programming
CO 2: Know the overall structure and concept of logic building activity of Java programming language
CO 3: Identify the real-world things as well as the relationship between them and understand transforming them into their corresponding computer representations.
CO 4: Realise how to achieve code reusability using inheritance, interfaces and packages and expedite application development activities.
CO 5: Familiarise simple and robust way of handling multitasking and runtime error as well as such kinds of abnormal situations within a program.

Unit I

Introduction to Java - History, Features of Java, Byte Code, Java Language Fundamentals - Data Types, Variables, Arrays, Operators - Arithmetic, Bitwise, Relational, Boolean Logical, Assignment, Control Statements - if, else, else if, switch, while, do-while, for, break, continue, return.

(16 Hours)

Unit II

Object Oriented Programming Concepts - Abstraction, Data Hiding, Encapsulation, Polymorphism, Inheritance, Concepts of Class and Objects, Methods, Constructors, Garbage Collection, Method Overloading, Access Control, static members, Nested and Inner Classes, String Class, String Buffer and String Builder, Varargs. Inheritance - Basics, Member Access and Inheritance, Multi-level Inheritance, Method Overriding, Dynamic Method Dispatching, Abstract Class, Object Class.

(20 Hours)

Unit III

Packages - Introduction, Creating a Package, CLASSPATH, Packages and Member Access, Simple Programs using Package, Importing Packages, Interfaces - definition and implementation, Simple programs using Interface, Default interface methods.
Exception handling- Basics, try, catch, finally, multiple catch, nested try, throw, throws, finally, User Defined exception, Chained Exception.

(16 Hours)

Unit IV

Multi-threaded Programming - Basics of threading, Creating threads, Thread Life Cycle, Thread Priorities, Synchronization. Enumerations, Type Wrappers, Autoboxing, Annotations, Generics - Basics, Wildcard Arguments, Generic Methods. Collections - Overview, Collection Classes - ArrayList Class, LinkedList Class.

(20 Hours)

Text Books

[1] Schildt, H. (2020). *Java: The Complete Reference, 11th Edition*. McGraw-Hill Education.

References

[1] Schildt, H. (2020). *Java: A Beginner's Guide, 8th Edition*. McGraw-Hill Education.
[2] Bloch, J. (2016). *Effective Java, 3rd Edition*. Pearson Education.
[3] Horstmann, C. (2016). *Core Java Volume I-Fundamentals, 10th Edition*. Pearson Education.
[4] Horstmann, C. (2020). *Core Java Volume II-Advanced Features, 11th Edition*. Pearson Education.
[5] Sierra, K., Bates, B. (2005). *Head First Java: A Brain-Friendly Guide, 2nd Edition*. O'Reilly Media.
[6] Horstmann, C. (2012). *Object-Oriented Design And Patterns, 2nd Edition*. Wiley.
[7] West, D., McLaughlin, B., Pollice, G. (2011). *Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D*. O'Reilly Media.

Marks Including Choice

Unit	Marks
I	12
II	16
III	16
IV	16

4B12ICSC: Lab 4: Object Oriented Programming Using Java

Semester	Course Code	Hours per Week	Exam Hours
4	4B12ICSC	3	3

Course Outcome

CO 1: Understand the concepts of object oriented programming
CO 2: Know the overall structure and concept of logic building activity of Java programming language
CO 3: Identify the real-world things as well as the relationship between them and understand transforming them into their corresponding computer representations.
CO 4: Realise how to achieve code reusability using inheritance, interfaces and packages and expedite application development activities.
CO 5: Familiarise simple and robust way of handling multitasking and runtime error as well as such kinds of abnormal situations within a program.

Exercises

1. Write a Java program to show method overloading.
2. Write a Java program to show the implementation of inheritance.
3. Write Java Program to show method overriding. (Exercise to understand Polymorphism)
4. Write a java program to implement interface.
5. Write a java program that handles various exceptions. Use try, catch and finally statements.
6. Write a java program to demonstrate threads using runnable interface
7. Write a java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
8. Write a program to show an implementation of Packages.
9. Write a java program to implement abstract classes.
10. Write a Java program using Java Swing to create a simple calculator. Arrange Buttons for digits and the + - * % operations properly. Add a text field to display the result. Handle any possible exceptions like divide by zero.
11. Write a Java program to display all records from a table using Java Database Connectivity (JDBC).
12. Write a program that demonstrates generics.

Text Books

[1] Schildt, H. (2020). *Java: The Complete Reference, 11th Edition*. McGraw-Hill Education.

References

[1] Schildt, H. (2020). *Java: A Beginner's Guide, 8th Edition*. McGraw-Hill Education.
[2] Bloch, J. (2016). *Effective Java, 3rd Edition*. Pearson Education.
[3] Horstmann, C. (2016). *Core Java Volume I-Fundamentals, 10th Edition*. Pearson Education.
[4] Horstmann, C. (2020). *Core Java Volume II-Advanced Features, 11th Edition*. Pearson Education.

[5] Sierra, K., Bates, B. (2005). *Head First Java: A Brain-Friendly Guide, 2nd Edition*. O'Reilly Media.
[6] Horstmann, C. (2012). *Object-Oriented Design And Patterns, 2nd Edition*. Wiley.
[7] West, D., McLaughlin, B., Pollice, G. (2011). *Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D*. O'Reilly Media.

4B13ICSC: Lab 5: Database Management System

Semester	Course Code	Hours per Week	Exam Hours
4	4B13ICSC	3	3

Course Outcome

CO 1: Understand the structure and characteristics of database system
CO 2: Learn to design and query data using relational database management systems.
CO 3: Implement queries using SQL for database creation, interaction, modification, and updation
CO 4: Implement procedures, functions, and control structures using PL/SQL
CO 5: Practice of SQL TCL commands like Rollback, Commit, Savepoint

Exercises

1. Implement DDL Statements in SQL.
2. Implement DML Statements in SQL.
3. Implement DCL statements in SQL.
4. Implement different types of operators in SQL
    a. Arithmetic, relational and logical operators
    b. BETWEEN … AND
    c. LIKE
    d. IN
5. Implement different types of SQL functions
    a. Character Functions (Character Manipulation, Case Conversion)
    b. Number Functions
    c. Aggregate Functions
6. Implement Join Statements in SQL
    a. Inner Join
    b. Outer Join (Left outer join, Right outer Join)
7. Implement Subqueries in SQL.
    a. Single Row Subqueries
    b. Multiple Row Subqueries
8. Implement views in SQL.
9. Implement WHERE, GROUP BY, ORDER BY and HAVING clauses in SQL.
10. Create a database procedure to add, update and delete a book to a Library database (use parameters).
11. Simple program for implementing cursors.

References

[1] Navathe, S., Elmasri, R. (2017). *Fundamentals of database systems*, *7th Edition*, Pearson Education.
[2] Sudarshan, S., Silberschatz, A., Korth, H. F. (2019). *Database System Concepts, 7th Edition*. McGraw-Hill.
[3] Ullman, J. D., Garcia-Molina, H., Widom, J. (2014). *Database Systems: The Complete Book, 2nd Edition*. Pearson Education.

[4] Ramakrishnan, R., Gehrke, J. (2000). *Database Management Systems, 3rd Edition*, McGraw-Hill.
[5] Ramesh, V., Hoffer, J. A., Topi, H. (2018). *Modern Database Management, 12th Edition*, Pearson Education.
[6] Begg, C., Connolly, T. (2020). D*atabase Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition,* Pearson Education.

Model Question Paper

4B09ICSC: Computer Organization

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. Draw the truth table for XOR gate
2. State the Demorgan's theorem
3. What is meant by the Sum-of-Products (SOP) Form?
4. Draw the circuit of an SR latch
5. What is Moore's law?
6. What is a structural hazard?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. Implement a full adder using 8:1 MUX
8. What are edge-triggered flip flops?
9. Draw a 4 bit Serial In Serial Out Shift register.
10. Write the design features of computer architecture.
11. Differentiate between data hazard and control hazard.
12. Explain about LRU Replacement algorithm used for cache memories.
13. What is PROM?
14. Explain memory hierarchy inside a computer.

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Explain about full adder.
16. Differentiate between multiplexers and demultiplexers
17. Differentiate between synchronous and asynchronous counters
18. Explain up/down synchronous counter in detail
19. Explain 4 stage pipelining with a diagram.
20. Explain how an instruction set can be encoded.

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Write a note on K Map. Use a Karnaugh map to minimize the following SOP expression B'C'D'+A'BC'D'+ABC'D'+A'B'CD+AB'CD+A'B'CD'+ A'BC'D'+ABCD'+AB'CD'
22. Demonstrate the working of a JK flip flop. How does it eliminate the invalid condition in SR flip flop? List out its applications.
23. Explain how a single data path can be represented for memory instructions and R-type instructions with the help of a diagram.
24. Explain in detail about various cache memory mapping techniques.

Model Question Paper

4B10ICSC: Database Management System

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. What is meant by a weak entity type?
2. What is meant by a database schema?
3. Define super key.
4. Give 2 DCL statements in SQL.
5. What is the criteria for a relation to be in 1 NF.
6. What are the 4 properties of a transaction known as ACID properties?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. What are the functions of a DBA?
8. Explain about INSERT statement in SQL.
9. Explain about left outer join in SQL.
10. What are views in SQL?
11. Explain about UPDATE statement in SQL.
12. What are aggregate functions in SQL?
13. Write a short note about MongoDB CRUD operations.
14. Write a short note about Neo4j Data Model.

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Explain about centralized and Client/Server architectures of DBMS.
16. Explain about specialiazation and generalization.
17. What is the need for concurrency control in a DBMS.
18. Explain about multivalued dependencies.
19. Explain how schedules can be characterized based on recoverability.
20. What are the characteristics of NOSQL systems?

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Explain about ER Model in detail.
22. Explain in detail about different relational algebra operations.
23. Explain in detail about different normal forms.
24. Explain in detail about NOSQL Key-Value stores.

Model Question Paper

4B11ICSC: Object Oriented Programming using Java

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer

Answer All Questions **(6 x 1 = 6 Marks)**

1. Define Byte code.
2. Define DMD.
3. What is the use of this keyword?
4. Differentiate between class and object.
5. What is the use of finally?
6. What is meant by autoboxing?

Part B: Short Essay

Answer Any 6 Questions **(6 x 2 = 12 Marks)**

7. What are the features of Java?
8. How is garbage collection done in Java?
9. What is a constructor?
10. What is meant by multi-level inheritance?
11. What is the use of the CLASSPATH environment variable?
12. Explain about chained exceptions.
13. Write a short note about type wrappers.
14. Write a short note about the ArrayList class.

Part C: Essay

Answer Any 4 Questions **(4 x 3 = 12 Marks)**

15. Explain about bitwise operators in Java.
16. What are the characteristics of Object oriented programming?
17. What are packages? How can packages be imported?
18. What is an interface? Explain with the help of an example.
19. Explain about the LinkedList class in Java with the help of an example.
20. Explain how thread synchronization is achieved in Java with the help of an example.

Part D: Long Essay

Answer Any 2 Questions **(2 x 5 = 10 Marks)**

21. Explain about different control statements in Java.
22. Differentiate between method overloading and method overriding with the help of examples.
23. Explain how exceptions are handled in Java with the help of an example.
24. What are generic methods? Explain with the help of an example.