Integral University Lucknow
Study & Evaluation Scheme
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
(w.e.f session 2021-22)

YEAR IInd, Semester – III

S. No.	Subject Code	Category	Subject	Periods				Evaluation Scheme				Subject Total
								Sessional			Exam	
				L	T	P	C	CT	TA	Total (CA)	ESE	
1	CS-204	DC	Data Structure using C	3	1	0	4	25	15	40	60	100
2	CS-270	DC	Object Oriented Concepts using Java	3	1	0	4	25	15	40	60	100
3	CS-206	DC	Discrete Structure	3	1	0	4	25	15	40	60	100
4	EC-209	ESA	Digital Electronics	3	1	0	4	25	15	40	60	100
5	CS-264	ESA	Fundamentals of Machine Learning (Watson)	3	1	0	4	25	15	40	60	100
6	ES-202 / CS203	ESA	Disaster management/Cyber Law & Information security	2	1	0	3	25	15	40	60	100
7	CS-272	DC	Python Programming Lab	0	0	2	1	30	30	60	40	100
8	CS-208	DC	Data structures Lab	0	0	2	1	30	30	60	40	100
9	CS-271	DC	Object Oriented Concepts using Java Lab	0	0	2	1	30	30	60	40	100
10	EC-214		Digital Electronics Lab	0	0	2	1	30	30	60	40	100
*	BM226	HM	Human Values and Professional Ethics	0	0	0	0	0	0	0	50	50
			Total	**17**	**6**	**8**	**27**	**270**	**210**	**480**	**520**	**1000**

L-Lecture   **T-**Tutorial   **P-**Practical   **C-**Credits   **CT-C**lass Test   **TA-T**eacher Assessment

Sessional Total **(CA)** = Class Test (CT) + Teacher Assessment (TA)

Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

DC- Departmental Core   **HM-** Humanities   **DE-** Departmental Elective

ESA- Engineering Sciences & Arts (Foundation Course & Engineering Courses

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Data Structure Using C, Subject Code: CS-204
SYLLABUS REVISED-2016
w.e.f. July-2016

L T P C
3 1 0 4

UNIT 1
Introduction to Data Structures: Basic Terminology, Elementary Data Organization, Data Structure Operations. Algorithms, Analysis of Algorithms, Complexity of Algorithms, Time-Space Tradeoff.
Arrays: Array Definition, Representation and Analysis, Single and Multi-Dimensional Arrays, Address Calculation, Application of Arrays, Character String Representation, Character String Operation, Sparse Matrices & Vectors.
Linked List: Representation and Implementation of Singly Linked List, Traversing, Searching of Linked List, Insertion & Deletion to/from Linked List, Underflow & Overflow. Circular Linked List, Doubly Linked List, Two-way Header List, Polynomial Representation & Addition, Generalized Linked List, Garbage Collection and Compaction. **C program based on above concept.** **[9]**

UNIT 2
Stacks: Array Representation and Implementation of Stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Application of Stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack.
Recursion: Recursive Definition and Processes, Recursion in C, Example of Recursion, Tower of Hanoi Problem.
Queues: Array and Linked Representation and Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty; Circular Queues, D-queues and Priority Queues. **C program based on above concept.** **[9]**

UNIT 3
Trees: Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm, Binary Search Tree (BST), Insertion and Deletion in BST, Path Length, AVL Trees, B-trees. **C program based on above concept.** **[8]**

UNIT 4
Searching and Hashing: Sequential Search, Binary Search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.
Sorting: Insertion Sort, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort. **C program based on above concept.** **[7]**

UNIT 5
Graphs: Terminology & Representations, Graphs & Multi-Graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees, **C program based on above concept.**
File Handling: Physical Storage Media File Organization, Organization of Records into Blocks, Sequential Files, Indexing and Hashing, Primary Indices, Secondary Indices. **[7]**

REFERENCES
1. A. M. Tannenbaum. "Data Structure Using C/C+"
2. Horowitz And Sahani. "Fundamental of Data Structure", Galgotia Publication
3. Lipschutz. "DataStructure", Schaumseries.

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Object Oriented Concepts using Java, Subject Code: CS-270
w.e.f. June-2020

L T P C
3 1 0 4

UNIT 1

Introduction: Programming language Types and Paradigms, Computer Programming Hierarchy, Features of Java Language, JVM –The heart of Java, Java's Magic Bytecode.
The Java Environment: Installing Java, Java Program Development, Java Source File , Structure, Compilation, Executions.
Basic Language Elements: Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Data types, Operators Assignments. **[9]**

UNIT 2

Object Oriented Programming using Java: Class Fundamentals, Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects, Constructor & initialization code block, Access Control, Modifiers, methods Nested, Inner Class &Anonymous Classes, Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism , Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method. Use of "this "reference, Use of Modifiers with Classes & Methods. **[8]**

UNIT 3

Extending Classes and Inheritance: Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods ,Use of "super", Polymorphism in inheritance, Type Compatibility and Conversion Implementing interfaces.
Package: Organizing Classes and Interfaces in Packages , Package as Access Protection , Defining Package, Making JAR Files for Library Packages Import and Static Import Naming Convention For Packages. **[8]**

UNIT 4

Exception Handling: Exceptions & Errors ,Types of Exception ,Control Flow In Exceptions, ,Use of try, catch, finally, throw, throws in Exception Handling ,In-built and User Defined Exceptions, Checked and Un-Checked Exceptions.
Array & String: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String, Mutable & Immutable String, Creating Strings using StringBuffer. **[8]**

UNIT 5

Thread: Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads.
I/O Classes: Input/output Operation in Java(java.io Package),Streams and the new I/O Capabilities ,Understanding Streams, The Classes for Input and Output, The Standard Streams, Working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel. **[9]**

REFERENCES:
1. T.Budd, "An Introduction to OOP" Pearson Education
2. Naughton, Schildt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA", TMH
4. "Head First Java" by Kathe Sierra.
5. "A Beginner's Guide (Sixth Edition)" by Herbert Schildt

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Discrete Structure, Subject Code: CS-206
SYLLABUS REVISED-2016
w.e.f. July-2016

L T P C
3 1 0 4

UNIT 1
Set Theory: Definition of Sets, Countable and Uncountable Sets, Venn Diagrams, Proofs of Some General Identities on Sets
Relation: Definition, Types of Relation, Composition of Relations, Pictorial Representation of Relation, Equivalence Relation, Partial Ordering Relation.
Function: Definition, Type of Functions, One to One, Into and Onto Function, Inverse Function, of Functions, Recursively Defined Functions.
Theorem Proving Techniques: Mathematical Induction Simple and Strong), Pigeonhole Principle, Prove by Contradiction. **[8]**

UNIT 2
Algebraic Structures: Definition, Properties, Types: Semi Groups, Monoid, Groups, Abelian Group, Properties of Groups, Subgroup, Cyclic Groups, Cosets, Factor Group, Permutation Groups, Normal Subgroup, Homomorphism and Isomorphism of Groups, Example and Standard Results, Rings and Fields: Definition and Standard Results.
[8]

UNIT 3
Posets, Hasse Diagram and Lattices: Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded I and Complemented Lattices.
Boolean Algebra: Basic Definitions, Sum of Products and Product of Sums, Form in Boolean Algebra, Logic Gates and Karnaugh Maps.
Tree: Definition, Rooted Tree, Properties of Trees, Binary Search Tree, Tree Traversal. **[9]**

UNIT 4
Propositional Logic: Proposition, First Order Logic, Basic Logical Operation, Truth Tables, Tautologies, Contradictions, Algebra of Proposition, Logical Implications, Logical Equivalence, Predicates, Universal And Existential Quantifiers. **[7]**

UNIT 5
Combinatorics & Graphs: Recurrence Relation, Generating Function, Simple Graph, Multi Graph, Graph Terminology, Representation of Graphs, Bipartite, Regular, Planar and Connected Graphs, Connected Components in a Graph, Euler Graphs, Hamiltonian Path and Circuits, Graph Coloring, Chromatic Number, Isomorphism and Homomorphism of Graphs. **[8]**

REFERENCES
1. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
2. Trembley, J. P. & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
4. Deo, Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
5. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Digital Electronics, Subject Code: EC-209
SYLLABUS REVISED-2016
w.e.f. July-2016

LT P C
3 1 0 4

UNIT 1
Wave shaping: RC High Pass Circuit, Low Pass Circuit, Response to Sine, Step, Pulse and Square Wave Inputs. RC Circuit as a Differentiator, Integrator and Compensated Attenuator.
Number Systems, Review of Boolean Algebra, Minimization of Boolean Functions, K-Map, Don't Care Input Combinations, Tabular Method. **[8]**

UNIT 2
Logic families: Use of Diode, Transistor, and MOSFET as a Digital Circuit Element; Formation of Basic Logic Gates, and Study of their Input-Output Characteristics, Fan-in, Fan-out, Noise Margin, Circuit Concept and Comparison of Various Logic Families- TIL, IIL, ECL, NMOS and CMOS. Tristate Logic, Open Collector Output Circuits; Interfacing between Logic Families; Power Consumption, Gate Delay. **[8]**

UNIT 3
Combinational Circuits: Decoders, Encoders, Three State Devices, Multiplexer Demultiplexer, Comparator, Adder, Sub Tractor, ALU, Hazards and its Avoidance.
[8]

UNIT 4
Sequential Circuit: Latches, Flip Flops, Shift Registers, Counters; Synchronous and Asynchronous Sequential Circuits, Multivibrators. **[8]**

UNIT 5
Memory: ROM, PROM, EPROM & EEPROM; RAM, SRAM and DRAM; PLA, PAL, PLD; FPGA, Bi CMOS circuits. **[8]**

REFERENCES
1. Mano, M. Morris / "Digital Design" / Prentice Hall /
2. Mano, M. Morris / "Digital Logic and computer Design" / PHI
3. Gopalan, k. "Go pal" / Introduction to Digital Microelectronic circuits" / TMH.
4. Jacob Mill man and Herbert Taub / Pulse, Digital and switching wave forms "TMH
5. Malvino, A.P. and Leach. Donald P. / "Digital Principles and applications"/ TMH.
6. R. P. Jain, Modem Digital Electronics, TMH.
7. J. M. Yarbrough, Digital Logic: Applications and Design' Vikas Publishing.

L T P C
2 1 0 3

Objective: The objective of this course is to familiarize the students with basic management principles relating to disaster management and mitigation techniques.

UNIT 1

Concept of Disaster Management. Types of disaster and their impact:Natural and Man-made like- Earthquakes, Floods,Droughts, Cyclones,Avalanches,Forest Fires, Terrorism related disaster etc. Assessment of Human and Economic Losses.

UNIT 2

Impact of Extensive Industrialization, Impact of Global Warming and Environmental degradation, National and Global Disaster.

UNIT 3

National Policy for Disaster Management, Elementary knowledge of the disaster management Act 2005. Types of Responses: Central, State, District level, People's community participation in Disaster management. Post Disaster management and Rehabilitation measures.

UNIT 4

Capacity building for meeting disasters. Long- term measures for prevention of Disasters. Mitigation techniques/ Strategies: Early Warning Systems, Data sharing at National and International Levels.

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Cyber Law And Information Security, Subject Code: CS-203
SYLLABUS REVISED-2016
w.e.f. July-2016

L T P C
2 1 0 3

Unit1
Fundamentals of Cyber Law: Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout & design. **[7]**

Unit 2
E - Commerce: Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, E-Governance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, Ecommerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices.
Digital Signatures: Technical issues, legal issues, Electronic Records, Digital Contracts, Requirements of Digital Signature System. **[8]**

Unit 3
Investigation and Ethics: Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of different countries of cyber crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking.
Internet Security Threats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs. Introduction to biometric security and its challenges, Finger prints. Cyber crime forensic: CASE STUDY in Cyber Crime. **[8]**

Unit 4
Information security: Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles.
Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection. **[9]**

References:
1. Harish Chander, "Cyber Law and IT Protection", PHI Publication, New Delhi
2. Merkov, Breithaupt, "Information Security", Pearson Education
3. "Cyber Law in India" - Farooq Ahmad-Pioneer books.
4. K. K. Singh, Akansha Singh "Information Security and Cyber law", Umesh Publication, Delhi

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Human Values & Professional Ethics, Subject Code: BM-226
SYLLABUS REVISED-2016
w.e.f. July-2016

L T P C
3 0 0 0

Unit-1 [6]
Human Value Education: Understanding the need, basic guidelines, content and process for Value Education, Self Exploration - Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly.

Unit-2 [6]
Introduction to Ethical Concept: Definition of industrial ethics and values, Ethical rules of industrial worker. Values and Value Judgments. Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property and the Law. Ethics as Law

Unit-3 [6]
Professional Responsibility: The basis and scope of Professional Responsibility, Professions and Norms of Professional Conduct, Ethical Standards versus Profession, Culpable mistakes, the Autonomy of professions and codes of ethics. Employee status and Professionalism. Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, hazards and risks.

Unit-4 [6]
Engineers Ethics: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Cooperation – Commitment.

Unit-5 [6]
Global Issues: A Glimpse of Life Stories: Life story of Prophet Mohammad, Mahatma Gandhi, Swami Vivekanand, Marie Curie and Steve Jobs.
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership

Reference Readings:

Text Book
1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Relevant CDs, Movies, Documentaries & Other Literature:
1. Value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story
6. The Hundred, Michael Hart

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Fundamentals of Machine Learning
Subject Code: CS-264
w.e.f. July 2021

L T P C
3 1 0 4

UNIT 1
Introduction to Machine Learning: Application of Machine Learning, Supervised vs Unsupervised Learning, Python libraries suitable for Machine Learning   **[8]**

UNIT 2
Data Pre-processing and Data: Identifying and handling the missing values, Encoding the categorical data, Normalization, Standardization, PCA   **[8]**

UNIT 3
Regression: Linear Regression, Non-Linear Regression, Model evaluation methods   **[8]**

UNIT 4
Classification: K-Nearest Neighbour, Decision Tree, Logistic Regression, Support Vector Machines, Model Evaluation   **[8]**

UNIT 5
Unsupervised Learning and Recommender Systems: K-means Clustering, Hierarchical Clustering, Density-Based Clustering, Content-based recommender system, Collaborative Filtering   **[8]**

REFERENCES:
1. Machine Learning by Tom M. Mitchell, O`Reilley
2. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili, Manning Publications
3. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Technique   to Build Intelligent Systems by Aurélien Géron
4. Understanding Machine Learning by Shai Shalev-Shwartz and Shai Ben-David La

Further Suggested Readings:
1. Visualizing and understanding convolutional networks by Zeiler, Matthew D., and Rob Fergus.

LIST OF EXPERIMENTS:
1. Implement the Stock market value Prediction
2. Predict the chance of Admission of the student in university
3. Implement Diabetic Prediction
4. Predict the category of the Mushroom (Edible or Poisonous)
5. Write a Code for News Classification
6. Write a Code for Twitter Sentimental Analysis
7. Implement Wine quality Prediction
8. Write a Program To check eligibility of Person for loan
9. Write a Code for K-Means: clustering of dataset
10. Implement Clustering of Mall Data Customer Datasets
11. Create movie recommendation system

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Data Structure using C Lab, Subject Code: CS-208
w.e.f. July-2016

L T P C
0 0 2 1

Write Programs for the Following:-

1. To implement traversing, insertion and deletion in Arrays.
2. To implement, addition, multiplication of two Sparse Matrices.
3. To implement insertion, deletion and pattern matching of a substring in a given string using Linked List.
4. To implement insertion and deletion in singly Linked List at given location as well as for a given item in sorted List.
5. To implement insertion and deletion in Circular Linked List.
6. To implement insertion and deletion in Stack and Queue using arrays and pointer.
7. To implement Fibonacci Series and Tower of Hanoi using Recursion.
8. Creation of Trees and Tree Traversal Algorithms: Recursive and Non-Recursive.
9. Creation of Graphs and Graph Traversal Algorithms.
10. Sorting:
    a. Insertion Sort
    b. Quick Sort
    c. Merge Sort
    d. Bubble Sort
    e. Heap Sort
11. Implementation of Sparse Matrix and Polynomial using Link List.

Integral University, Lucknow
Department of Computer Science & Engineering
B. Tech. CSE (Cloud Computing and Artificial Intelligence) in association with IBM
2nd Year/3rd Semester
Subject Name: Digital Electronics Lab, Subject Code: EC-214
w.e.f. July-2016

L T P C
0 0 2 1

1. Realize OR, NOR, XOR, XNOR gates using NAND gate and verify its truth table
2. Design and study of 1-bit Magnitude Comparator
3. Design of Shift Registers
4. (a) Design and test a CODE CONVERTER from decimal number to binary number. Use diode and LED's.
    (b) Measure voltage drop across the diodes, LED's and resistor R. Find the current flowing through LED.
5. (a) Assemble the Half Adder circuit using X-OR and AND gates. Verify the truth table for Half Adder.
    (b) Using two Half Adder and an OR gate, assemble Full Adder circuit, verify truth table.
    (c) Express sum and carry with all the minterms in minimization possible?
6. Display of decimal digits using 7 segments LED display and a suitable decoder.
    (a) Use a BCD to 7 segment decoder 0-9 digits.
    (b) Study the 7 segment LED display. Is it common anode or common cathode type? What is a suitable value of R for bright display of digit?
    (c) Design a BCD to 7-segment decoder using NAND gates. Use K-maps and don't care terms to implement the design with minimum number of gates.
7. STUDY OF FLIP-FLOPS
    (a) Design and test J-K, F/F using NAND gates.
    (b) Study J-K Master- Slave F/F IC 74LS76. Make special observations of edge triggering, preset and clear.
    (c) Make and test D-F/F and T-F/F and verify its truth table
8. STUDY OF COUNTER
    Design MOD-10 Counter using Master - Slave F/F (7476) and logic gates. (7400 & 7408) Verify its truth-table.
9. Study and verify 4-bit adder/subtractor circuit using IC7483 and IC7486.
10. STUDY THE X-OR GATE IV MODULE (7486)
    (a) Verify the truth table and record the voltage levels.
    (b) Design a 3-input X-OR gate using 2-input X-OR gate. Obtain its truth table F1=A+B+C.
    (c) Design a 3-input X-NOR gate using 7486 & 7402. Obtain its truth table. F2=A⊙B⊙C.
    (d) Find the expression of F1and F2 as sum of product (SOP) and compare F1and F2.