DESIGN AND ANALYSIS OF ALGORITHMS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS42	**CIE Marks**	40
Number of Contact Hours/Week	3:2:0	**SEE Marks**	60
Total Number of Contact Hours	50	**Exam Hours**	3 Hrs
CREDITS –4			

Course Learning Objectives: This course (18CS42) will enable students to:

- Explain various computational problem solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

Module 1	**Contact Hours**
Introduction: What is an Algorithm? **(T2:1.1),** Algorithm Specification **(T2:1.2),** Analysis Framework **(T1:2.1), Performance Analysis**: Space complexity, Time complexity **(T2:1.3)**. **Asymptotic Notations:** Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples **(T1:2.2, 2.3, 2.4). Important Problem Types:** Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries. **(T1:1.3,1.4).** **RBT: L1, L2, L3**	10
Module 2	
Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum **(T2:3.1, 3.3, 3.4)**, Merge sort, Quick sort **(T1:4.1, 4.2)**, Strassen's matrix multiplication **(T2:3.8)**, Advantages and Disadvantages of divide and conquer. **Decrease and Conquer Approach:** Topological Sort. **(T1:5.3).** **RBT: L1, L2, L3**	10
Module 3	
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines **(T2:4.1, 4.3, 4.5). Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm **(T1:9.1, 9.2)**. **Single source shortest paths:** Dijkstra's Algorithm **(T1:9.3)**. **Optimal Tree problem:** Huffman Trees and Codes **(T1:9.4)**. **Transform and Conquer Approach:** Heaps and Heap Sort **(T1:6.4)**. **RBT: L1, L2, L3**	10
Module 4	
Dynamic Programming: General method with Examples, Multistage Graphs **(T2:5.1, 5.2)**. **Transitive Closure:** Warshall's Algorithm, **All Pairs Shortest Paths:** Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem **((T1:8.2, 8.3, 8.4)**, Bellman-Ford Algorithm **(T2:5.4)**, Travelling Sales Person problem **(T2:5.9)**, Reliability design **(T2:5.8)**. **RBT: L1, L2, L3**	10
Module 5	
Backtracking: General method **(T2:7.1)**, N-Queens problem **(T1:12.1)**, Sum of subsets problem **(T1:12.1)**, Graph coloring **(T2:7.4)**, Hamiltonian cycles **(T2:7.5)**. **Branch and Bound:** Assignment Problem, Travelling Sales Person problem **(T1:12.2)**, **0/1 Knapsack problem (T2:8.2, T1:12.2):** LC Branch and Bound solution **(T2:8.2)**, FIFO Branch and	10

Bound solution **(T2:8.2)**. **NP-Complete and NP-Hard problems:** Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes **(T2:11.1)**. **RBT: L1, L2, L3**	

Course Outcomes: The student will be able to :

- Describe computational solution to well known problems like searching, sorting etc.
- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design strategies for problem solving.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education).

OPERATING SYSTEMS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS43	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	3 Hrs
CREDITS –3			

Course Learning Objectives: This course (18CS43) will enable students to:

- Introduce concepts and terminology used in OS
- Explain threading and multithreaded systems
- Illustrate process synchronization and concept of Deadlock
- Introduce Memory and Virtual memory management, File system and storage techniques

Module 1	**Contact Hours**
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **Process Management** Process concept; Process scheduling; Operations on processes; Inter process communication	08
Module 2	
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. **Process Synchronization:** Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	08
Module 3	
Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	08
Module 4	
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **File System, Implementation of File System:** File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	08
Module 5	
Secondary Storage Structures, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. **Case Study: The Linux Operating System:** Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	08

Course Outcomes: The student will be able to :

- Demonstrate need for OS and different types of OS
- Apply suitable techniques for management of different resources
- Use processor, memory, storage and file system commands
- Realize the different concepts of OS in platform of usage through case studies

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006

Reference Books:

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

MICROCONTROLLER AND EMBEDDED SYSTEMS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS44	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	3 Hrs
CREDITS –4			

Course Learning Objectives: This course (18CS44) will enable students to:

- Differentiate between microprocessors and microcontrollers.
- Explain the architecture of ARM processor with its instruction set.
- Identify the applicability of the embedded system
- Comprehend the real time operating system used for the embedded system

Module 1	**Contact Hours**
Microprocessors versus Microcontrollers, **ARM Embedded Systems: The** RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, **ARM Processor Fundamentals:** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions **Text book 1:Chapter1 - 1.1 to 1.4, Chapter2 - 2.1 to 2.5** **RBT: L1, L2**	08
Module 2	
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions **Text book 1:Chapter1 - 1.1 to 1.4, Chapter2 - 2.1 to 2.5**	08
Module 3	
Embedded System Components: Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components. **Text book 2: All the Topics from Chapter1 and Chapter2**	08
Module 4	
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational and non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modeling, embedded firmware design and development **Text book 2: Chapter-3, Chapter-4, Chapter-7 (Sections 7.1, 7.2 only), Chapter-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only)**	08
Module 5	
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Preemptive Task scheduling techniques, Task	08

Communication, Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques **Text book 2: Chapter-10 (Sections 10.1, 10.2, 10.3, 10.5.2 , 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Chapter 12, Chapter-13 (block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)**	

Course Outcomes: The student will be able to :

- Describe the architectural features and instructions of ARM microcontroller
- Apply the knowledge gained for Programming ARM for different applications.
- Interface external devices and I/O with ARM microcontroller.
- Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Develop the hardware /software co-design and firmware design approaches.
- Demonstrate the need of real time operating system for embedded system applications

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.
2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.

Reference Books:

1. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1st edition, 2005
2. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015
3. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008
4. Ragunandan, An Introduction to ARM System Design, Cengage Publication

OBJECT ORIENTED CONCEPTS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS45	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	3 Hrs
CREDITS –3			

Course Learning Objectives: This course (18CS45) will enable students to:

- Learn fundamental features of object oriented language and JAVA
- Set up Java JDK environment to create, debug and run simple Java programs.
- Create multi-threaded programs and event handling mechanisms.
- Introduce event driven Graphical User Interface (GUI) programming using applets and swings.

Module 1	**Contact Hours**
Introduction to Object Oriented Concepts: A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping, Function Overloading. **Class and Objects:** Introduction, member functions and data, objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors. **Text book 1: Ch 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6 Ch 4: 4.1 to 4.2**	08
Module 2	
Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements. **Text book 2: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5**	08
Module 3	
Classes, Inheritance, Exceptions, Packages and Interfaces: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **Inheritance:** inheritance basics, using super, creating multi level hierarchy, method overriding. **Exception handling:** Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces. **Text book 2: Ch:6 Ch: 8 Ch:9 Ch:10**	08
Module 4	
Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer consumer problems. **Event Handling:** Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes. **Text book 2: Ch 11: Ch: 22**	08
Module 5	
The Applet Class: Introduction, Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface;Output to the Console. **Swings:** Swings: The origins of Swing; Two key	08

Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable. **Text book 2: Ch 21: Ch: 29 Ch: 30**	

Course Outcomes: The student will be able to :

- Explain the object-oriented concepts and JAVA.
- Develop computer programs to solve real world problems in Java.
- Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using Applets and swings.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press,2006 (Chapters 1, 2, 4)
2. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 1, 2, 3, 4, 5, 6, 8, 9,10, 11, 21, 22, 29, 30)

Reference Books:

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806
2. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
3. Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005.
4. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
5. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
6. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

Note: Every institute shall organize a bridge organize on C++ either in the vacation or in the beginning of even semester.

DATA COMMUNICATION
(Effective from the academic year 2018 -2019)
SEMESTER – IV

Subject Code	18CS46	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	3 Hrs

CREDITS –3

Course Learning Objectives: This course (18CS46) will enable students to:

- Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Explain with the basics of data communication and various types of computer networks;
- Illustrate TCP/IP protocol suite and switching criteria.
- Demonstrate Medium Access Control protocols for reliable and noisy channels.
- Expose wireless and wired LANs.

Module 1	**Contact Hours**
Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, **Networks Models**: Protocol Layering, TCP/IP Protocol suite, The OSI model, **Introduction to Physical Layer-1:** Data and Signals**,** Digital Signals, Transmission Impairment, Data Rate limits, Performance.	08
Module 2	
Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding). **Physical Layer-2:** Analog to digital conversion (only PCM), Transmission Modes, **Analog Transmission**: Digital to analog conversion,	08
Module 3	
Bandwidth Utilization: Multiplexing and Spread Spectrum, **Switching**: Introduction, Circuit Switched Networks and Packet switching. **Error Detection and Correction**: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction**,**	08
Module 4	
Data link control: DLC services, Data link layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only). **Media Access control**: Random Access, Controlled Access and Channelization,	08
Module 5	
Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, **Wireless LANs:** Introduction, IEEE 802.11 Project and Bluetooth. **Other wireless Networks**: WIMAX, Cellular Telephony, Satellite networks	08

Course Outcomes: The student will be able to :

- Explain the various components of data communication.
- Explain the fundamentals of digital communication and switching.
- Compare and contrast data link layer protocols.
- Summarize IEEE 802.xx standards

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.

- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013. (Chapters 1.1 to 1.5, 2.1 to 2.3, 3.1, 3.3 to 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.4, 12.1 to 12.3, 13.1 to 13.5, 15.1 to 15.3, 16.1 to 16.3)

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CSL47	**CIE Marks**	40
Number of Contact Hours/Week	0:2:2	**SEE Marks**	60
Total Number of Lab Contact Hours	36	**Exam Hours**	3 Hrs
Credits – 2			

Course Learning Objectives: This course (18CSL47) will enable students to:

- Design and implement various algorithms in JAVA
- Employ various design strategies for problem solving.
- Measure and compare the performance of different algorithms.

Descriptions (if any):

- Design, develop, and implement the specified algorithms for the following problems using Java language under LINUX /Windows environment. Netbeans / Eclipse IDE tool can be used for development and demonstration.

Programs List:

1.	
a.	Create a Java class called ***Student***with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create *nStudent* objects and print the USN, Name, Branch, and Phoneof these objects with suitable headings.
b.	Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2.	
a.	Design a superclass called ***Staff*** with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely ***Teaching*** (domain, publications), ***Technical*** (skills), and ***Contract*** (period). Write a Java program to read and display at least 3 *staff* objects of all three categories.
b.	Write a Java class called ***Customer*** to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".
3.	
a.	Write a Java program to read two integers *a* and*b*. Compute *a*/*b* and print, when *b* is not zero. Raise an exception when *b* is equal to zero.
b.	Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number andprints; third thread will print the value of cube of the number.
4.	Sort a given set of ***n*** integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort.

	Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5.	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6.	Implement in Java, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.
7.	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in Java.
8.	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal'salgorithm.** Use Union-Find algorithms in your program
9.	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**.
10.	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using **Floyd's algorithm**. (b) Implement **Travelling Sales Person problem** using Dynamic programming.
11.	Design and implement in Java to find a **subset** of a given set **S** = {Sl, S2,.....,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2, 5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
12.	Design and implement in Java to find all **Hamiltonian Cycles** in a connected undirected Graph G of *n* vertices using backtracking principle.

Laboratory Outcomes: The student should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structuresto solve real-world problems.

Conduct of Practical Examination:

- All laboratory experiments, excluding the first, are to be included for practical examination.
- Experiment distribution
    - For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.

- For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution *(Subjected to change in accoradance with university regulations)*
  e) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  f) For questions having part A and B
     i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks
     ii. Part B – Procedure + Execution + Viva = 10 + 49+ 11 = 70 Marks

MICROCONTROLLER AND EMBEDDED SYSTEMS LABORATORY
(Effective from the academic year 2018 -2019)
SEMESTER – IV

Subject Code	18CSL48	**CIE Marks**	40
Number of Contact Hours/Week	0:2:2	**SEE Marks**	60
Total Number of Lab Contact Hours	36	**Exam Hours**	3 Hrs

Credits – 2

Course Learning Objectives: This course (18CSL48) will enable students to:

- Develop and test Assembly Language Program (ALP) using ARM7TDMI/LPC2148
- Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

Descriptions (if any):

-

Programs List:

PART A Conduct the following experiments by writing Assembly Language Program (ALP) using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.

1.	Write an ALP to multiply two 16 bit binary numbers.
2.	Write an ALP to find the sum of first 10 integer numbers.
3.	Write an ALP to find factorial of a number.
4.	Write an ALP to add an array of 16 bit numbers and store the 32 bit result in internal RAM
5.	Write an ALP to find the square of a number (1 to 10) using look-up table.
6.	Write an ALP to find the largest/smallest number in an array of 32 numbers .
7.	Write an ALP to arrange a series of 32 bit numbers in ascending/descending order.
8.	Write an ALP to count the number of ones and zeros in two consecutive memory locations.

PART –B Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

9.	Display “Hello World” message using Internal UART.
10.	Interface and Control a DC Motor.
11.	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
12.	Determine Digital output for a given Analog input using Internal ADC of ARM controller.
13.	Interface a DAC and generate Triangular and Square waveforms.
14.	Interface a 4x4 keyboard and display the key code on an LCD.
15.	Demonstrate the use of an external interrupt to toggle an LED On/Off.
16.	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between

Laboratory Outcomes: The student should be able to:

- Develop and test Assembly Language Program (ALP) using ARM7TDMI/LPC2148
- Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

Conduct of Practical Examination:

- All laboratory experiments, excluding the first, are to be included for practical examination.
- Experiment distribution
    - For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
    - For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure part to be made

zero.

- Marks Distribution *(Subjected to change in accoradance with university regulations)*
  g) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  h) For questions having part A and B
     i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks
     ii. Part B – Procedure + Execution + Viva = 10 + 49+ 11 = 70 Marks

MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS51	**CIE Marks**	40
Number of Contact Hours/Week	2:2:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	3 Hrs
CREDITS – 03			

Course Learning Objectives: This course (18CS51) will enable students to:

- Explain the principles of management, organization and entrepreneur.
- Discuss on planning, staffing, ERP and their importance
- Infer the importance of intellectual property rights and relate the institutional support

Module – 1	**Contact Hours**
Introduction - Meaning, nature and characteristics of management, scope and Functional areas of management, goals of management, levels of management, brief overview of evolution of management theories,. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of Organization, Staffing- meaning, process of recruitment and selection	**08**
Module – 2	
Directing and controlling- meaning and nature of directing, leadership styles, motivation Theories, Communication- Meaning and importance, Coordination- meaning and importance, Controlling- meaning, steps in controlling, methods of establishing control.	**08**
Module – 3	
Entrepreneur – meaning of entrepreneur, characteristics of entrepreneurs, classification and types of entrepreneurs, various stages in entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India and barriers to entrepreneurship. Identification of business opportunities, market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.	**08**
Module – 4	
Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for project report, **Enterprise Resource Planning: Meaning and Importance- ERP** and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation	**08**
Module – 5	
Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India indusial policy 2007 on micro and small enterprises, case study (Microsoft), Case study(Captain G R Gopinath),case study (N R Narayana Murthy & Infosys), **Institutional support:** MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, **Introduction to IPR.**	**08**

Course outcomes: The students should be able to:

- Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship
- Utilize the resources available effectively through ERP
- Make use of IPRs and institutional support in entrepreneurship