Question Bank
Sub : Computer Science

First Semester

> ➢ **Programming in C**
> ➢ **Computer Organization**

Programming in C

GROUP-A

Q-1(a) What do you mean by looping? Describe any two looping statements in 'C' programming with examples.   **6**

(b) Write and explain the syntax of switch statement with an example.   **6**

(c) Write short notes on: **6**
    (i)   Command Line Arguments
    (ii)   Dynamic Memory Allocation

(d) Describe the concept of Array of pointers with an example.   **6**

(e) Describe different tokens in C with examples   **6**

(f) Describe different Relational, Logical, Bitwise and Arithmetic operators available in C-Programming Language.   **6**

(g) Write short notes on: **6**
    (i)   GOTO Statements
    (ii)   Break Vs. Continue

(h) Write a program in C to find out sum of digits of a given number using function.   **6**

(i)   **6**

How can you declare a single character "@" in terms of Character and String? Write a program in C to read a String and count the number of words.

(j)   **6**

What is C-Programming Language? Draw a flow chart to execute a C-program. (It must describe all the steps from creation to execution).

(k)   **6**

Write notes on the followings with example:
- (i)   Rules of an Identifier
- (ii)   Data types in C

(l)   **6**

Differentiate between post-increment and pre-increment. Write a program in C to find out the greatest among three numbers using function.

(m)   **6**

What is meant by pointer? Write a program in C to input a String and print it in reverse order using pointer.

(n)   **6**

Find out the output of the followings with explanation.

(i)   (ii)   (iii)

```
main( ) {              main( ) {              main( ) {
int i=5, j=8;          int i=5, j;            int i=5, j=8;
j= (i > j) && (i<j);   j= ++i + i++ ;         if(i = j)
printf("%d %d", i, j); printf("%d %d", i, j);    printf("Hello");
}                      }                      else
                                                 printf("Hai"); }
```

(o)   **6**

What is File? Write a program in C to create a file, write some text in to the file and print it.

(p)   **6**

Differentiate the followings with example.
- (i)   Automatic Vs. External Variable
- (ii)   Function Definition Vs. Function Declaration

Group-B

Q-2   **9**

Distinguish between While-Do and Do-While looping structures. Write a program in C to calculate first 50 Fibonacci numbers using while-loop.

9

Q-3 Differentiate between Actual parameter and Formal parameter. Write a program in C to find out GCD of two numbers using function.

Q-4   **9**

What are the different decision control and branching statements available in C? Explain about each of them with suitable examples.

Q-5   **9**

What is recursion? Write a program in C to find out factorial of a given number using recursion.

Q-6   **9**

What is the difference between call-by-reference and call-by-value? Write a program in C to find greatest among two numbers using call-by-references.

Q-7   **9**

What is a pointer? What are the various operations allowed with pointer variables? Write

Q-8   a program in C to swap two variables using pointer.   **9**

What is a file? Discuss about the various modes in which a file can be opened in C language. What are the functions associated with opening and closing a file in C language?

Q-9   Explain different operators in C-Language with examples.   **9**

Q-10   Describe different looping statements in C with their syntax. Write a program in C to input   **9**
a number and find out the sum of digits of a number.

Q-11   Describe the concept of "Function returning pointers" and "Pointers to functions" with   **9**
examples.

Q-12   Differentiate the followings with syntax: **9**
         (i)   Malloc( ) Vs. Calloc( )
         (ii)   Call-by-Reference Vs. Call-by-Value
         (iii)   fprintf( ) Vs. fscanf( )

Q-13   Describe the concept of "Function with arguments and with return type" and "Function   **9**
with arguments and no return type" with examples.

Q-14   Describe the different storage classes available in C-Language with examples. Write down   **9**
the different scope rules associated with each storage classes.

Q-15   Describe different ways to initialize the Structure. Write a program in C to read Name,   **9**
Age and Roll of Two students and print them by using structure.

Q-16   Write short notes on: **9**
         (i)   Array of pointers
         (ii)   Different modes of Files
         (iii)   Error handling in File operation

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Computer Organization

Q-1 (a) Draw Karnaugh map and simplify the Boolean function: **6**
Y(A, B, C, D)= $\sum m$ (0, 3, 7, 8, 9, 11, 12 + $\sum d$ (1, 4, 14, 15). Draw the logic diagram of the final Boolean expression.

(b) Convert the following numbers into their binary equivalent **6**
(i) $(457)_8$ (ii) $(A2D)_{16}$ (iii) $(B2C)_{16}$

(c) Write notes on: **6**
(i) DRAM
(ii) Subroutine call
(iii) Virtual Memory

(d) What is an addressing mode and why it is necessary? Explain different types of addressing modes with suitable examples. **6**

(e) Why computer is called as Data processor. Draw and explain a block diagram to illustrate the basic organization of a computer system. **6**

(f) Write short notes on: **6**
(i) Flash Memory
(ii) RAMBUS Memory

(g) Draw and explain the concept of Adder-Subtractor with an example. **6**

(h) What do you mean by Instruction cycle? Explain different phases of an Instruction cycle. **6**

(i) What is meant by Dual and Complement of a Boolean expression? Discuss different types of Canonical forms of Logic expression with examples. **6**

(j) Draw Karnaugh map and simplify the Boolean function: **6**
Y(A, B, C, D)= $\sum m$ (0, 2, 4, 6, 8, 9, 11, 15) + $\sum d$ (1, 3, 13, 14)

(k) Convert the following numbers in to their binary equivalent: **6**
(i) $(236)_8$ (ii) $(A3B)_{16}$ (iii) $(915)_{16}$

(l) Describe different types of Addressing modes with examples. **6**

(m) Write short notes on: **6**
(i) Asynchronous Vs. Synchronous Counter
(ii) Multiplexer Vs. De-Multiplexer
(iii) Edge Triggering Vs. Level Triggering

(n) Differentiate between Synchronous and Asynchronous sequential circuit. Implement the following Boolean functions in PLA and PAL. **6**

A = xy' + x'y, B = x'z + xy , C = y'z + xz'

(o) Answer the followings:

	(i)	Draw the block and logic diagram of 3×8 Decoder.	**6**
	(ii)	Draw the block and logic diagram of 4×1 Multiplexer.	

(p) Write short notes on: **6**
- (i) Arithmetic Instructions
- (ii) Flash Memory
- (iii) Relative Addressing

Group-B

Q-2 What is meant by flip-flops? Describe about RS-Flip flop, JK-flip flop, T-flip flop and D-flip flop Block diagram, Logic diagram, Characteristic equation and characteristic table. **9**

Q-3 Describe different types of Programmable Logic Devices with diagrammatic representation. **9**

Q-4 Draw and explain the internal organization of Secondary Memories. **9**

Q-5 Write notes on: **9**
- (i) Shift registers
- (ii) Triggering'
- (iii) Finite State Machines

Q-6 Draw the block diagram, logic diagram, and truth table for **8*3** Encoder and **8*1** Multiplexer. **9**

Q-7 Describe different Instruction sets available in a typical microprocessor. **9**

Q-8 How many types of storage are normally there in the storage unit of a computer system? Justify the need of each storage type. Differentiate between the characteristics of primary and secondary storage of a computer system. **9**

Q-9 Differentiate between Flip-flop and Latch. Explain the JK-Flip-flop with its block diagram, logic diagram, characteristic table, characteristic equation, function table, excitation table and state diagram. **9**

Q-10 Represent the following numbers in a 8-bit memory register and Perform the operations in 2's-Complement form: **9**
- (i) $(16)_{10} + (-18)_{10}$
- (ii) $(-12)_{10} + (-14)_{10}$
- (iii) $(-23)_{10} + (15)_{10}$

Q-11 Write short notes on: **9**
- (i) Subroutines
- (ii) Types of ROM
- (iii) Mealy Vs. Moore Finite State Machines

Q-12 Describe different types of Programmable Logic Devices with their block diagrams. Give examples of each. **9**

Q-13 Draw and explain the internal organization of Memory chips. Differentiate between synchronous and asynchronous DRAMS. **9**

Write short notes on:
Q-14 (i)   Types of Computers **9**
  (ii) Instruction Sequencing
  (iii) Secondary Storage

Q-15 Differentiate between a Decoder and an Encoder. Draw and explain the octal to binary encoder with its block diagram, truth table and logic diagram. **9**

Q-16 What is an interrupt? Describe different types of interrupt with example. What is different between sub-routines and interrupt service routine? **9**

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Second Semester

• Programming Using C++
• Data Structure

Programming Using C++

GROUP-A

Q-1 (a) Explain the concept of object oriented programming. What are the difference between object based and object oriented programming.   **6**

(b) Discuss how the concept of polymorphism is implemented in C++ language.   **6**

(c) When we declare member of a class STATIC? What is their implication? Explain with examples.   **6**

(d) Explain the concept of friend function with a suitable example.   **6**

(e) Write a C++ program segment to overload the "+" operator to add two complex numbers.   **6**

(f) Describe different types of modes in File with example.   **6**

(g) Write short notes on:
(i) Command-Line Arguments   **6**
(ii) Abstract Class

(h) Describe the concept of Inline function with an example.   **6**

(i) Discuss the utility of friend functions in C++ with a suitable example.   **6**

(j) Write and explain the concept of operator overloading with a suitable example.   **6**

(k) What is Template class? Discuss in details.   **6**

(l) Describe the Virtual function with a suitable example   **6**

(m) Write short notes on :
(i) Nested Class
(ii) Templates   **6**
(iii) Exception handling

GROUP-A

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Q-2 Differentiate between constructor and destructor. Explain the concept of copy constructor with an example. **9**

Q-3 What is scope resolution operator? How is it useful for defining the data member and member function of a class? **9**

Q-4 What is inheritance? Describe different types of inheritance with examples. **9**

Q-5 Differentiate between Virtual function and pure-Virtual function. Describe the concept of Virtual function with an example. **9**

Q-6 Differentiate between Call-by-reference and Return-by-reference. Write a program in C++ to swap two numbers using Call-by-reference. **9**

Q-7 Write short notes on:
   (i)   Member Referencing Operators
   (ii) C++ Streams
   (iii) Member Classes **9**

Q-8 Describe different types of Expressions in C++ with examples. What is meant by Type Cast Operator? **9**

Q-9 When we declare member of a class STATIC? What is their implication? Explain with examples. **9**

Q-10 What is scope resolution operator? How is it useful for defining the data member and member function of a class? **9**

Q-11 What is Operator overloading? Why it is necessary? Explain. **9**

Q-12 Write a C++ program segment to overload the "+" operator to add two complex numbers. **9**

Q-13 What is meant by object oriented languages? Draw and explain the comparative chart of various object oriented programming languages. **9**

Discuss how the concept of polymorphism is implemented in C++ language.

Q-14 What is Object based programming and how object based program can be transformed to object oriented program? Discuss. List some of the benefits of OOP. **9**

Q-15 **9**

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Data Structure

GROUP-A

Q-1 (a) Convert the following postfix expression into its infix form by using a stack: **6**
A B + C ^ D E * F / -

(b) Define a Dqueue? How it differs from circular queue? Write an algorithm to insert and delete an element into a Queue. **6**

(c) Draw a binary tree for the following expression and find out its pre-order traversal expressions. **6**
E = 5 * 7 + (4 – 8 * 9) – 6 / 2

(d) Write and explain Round Robin algorithm with an example. **6**

(e) Write short notes on: **6**
    (i)   Compaction
    (ii)   Boundary Tag System
    (iii)   Decision Tree

(f) Insert the following elements in to a heap tree and after insertion delete the node 89. **6**
66, 43, 55, 23, 16, 5, 89, 88, 49, 23, 34

(g) Write and explain the algorithm for Tower of Hanoi with an example. **6**

(h) What is meant by memory representation? Represent Stack and Queue in memory in terms of Array and Linked List. **6**

(i) Differentiate between Stack and Queue? Write down PUSH and POP procedures of Stack with example. **6**

(j) Convert the following postfix expression into its infix form by using a stack: **6**
F G + D ^ H M * P / -

(k) What is Queue? Write the insertion and deletion procedure in queue data structure. **6**

(l) Convert the following infix expression in to its postfix form by using a stack. **6**
H + K * N / O + P ^ 3

(m) What are the advantages of a Linked list over array? **6**

(n) How can you perform different operations on Polynomial using Linked list? Give examples. **6**

(o) Write an algorithm to insert an element in a circular linked list. **6**

Group-B

Q-2 What is AVL tree? Construct an AVL tree with the node values in the following order. **9**
Jan, Feb, Mar, Apr, May, June, July, Aug, Sep, Oct, Nov, Dec

Q-3 Differentiate between Single, Double and Circular Linked list? Write an algorithm in C to **9**
insert an element in to a double linked list.

Q-4 Write short notes on: **9**
      (i)   De-allocation Strategy
      (ii)   Memory Representation of Tree
      (iii)   Applications of Queues

Q-5 What is a BST? Construct a BST with the node values in the following order. **9**
    5, 7, 26, 44, 33, 12, 88, 54, 78, 22, 47, 23
After constructing the tree, delete the node 26.

Q-6 Sort the following elements by using Quick method. **9**
12, 33, 26, 5, 77, 37, 88, 99, 28, 67, 76, 18, 69, 44

Q-7 Write short notes on: **9**
      (i)   Full Vs. Complete Binary tree
      (ii)   Stack Vs. Queue
      (iii)   Array Vs. Linked List

Q-8 (a) Write the procedure to draw a tree if Pre-order and In-order is given. Construct the **4.5**
     tree where:
     Pre-order : AJMHKFCINLGEB
     In-order : ABCFHJMKEGILN
    (b) Write the procedure to draw a tree if Post-order and In-order is given. Construct **4.5**
     the tree where:
     Post-order : DFEBGIJKHCA
     In-order : DBFEAGCLJHK

Q-9 What are the different applications of Stack? Write down PUSH and POP procedures of **9**
Stack with example.

Q-10 What is a BST? Construct a BST with the node values in the following order. **9**
    55, 27, 6, 14, 43, 72, 98, 9, 5, 70, 12, 77, 88, 22

Q-11 Define a B-tree. Create a B tree from the following data set of order 3. **9**
    12, 33, 26, 5, 77, 37, 88, 99, 28, 67, 76, 18, 69, 44,31, 90

Q-12 Draw a binary tree for the following expression and find out its pre-order traversal **9**
expressions.
    E = 5 * 7 + (4 – 8 * 9) – 6 / 2

Q-13 What is AVL tree? Construct an AVL tree with the node values in the following order. **9**
Jan, Feb, Mar, Apr, May, June, July, Aug, Sep, Oct, Nov, Dec

Q-14 Write and explain the algorithm of Bubble sort with a suitable example. **9**

Q-15 Insert the following elements in to a heap tree and after insertion delete the node 72. **9**
    66, 43, 55, 23, 16, 5, 89, 88, 49, 23, 66, 78, 34

Third Semester

➤ OPERATING SYSTEMS
➤ DATABASE MANAGEMENT SYSTEM
➤ DISCRETE STRUCTURES

OPERATING SYSTEMS

GROUP-A

Q-1 (a) What is the purpose of system calls? Why are they necessary? How the system calls are different from system programs? **6**

(b) Define swapping. What should be the criteria for swapping a process in order to utilize optimality the system resources? **6**

(c) What is race condition? How does it differ from dead lock? Is it possible to have a deadlock involving only one single process? Explain your answer. **6**

(d) Write short notes on: **6**
    (i)   Process switching Vs. Context switching
    (ii)   Conditional critical region

(e) Compare issues of storage allocation in a file system with that of main memory allocation. What are the similarities and differences? **6**

(f) Write short notes on:
    (i)   Process Management **6**
    (ii)   System Boot

(g) Write short notes on: **6**
    (i)   System calls
    (ii)   Operating System Services

(h) Write short notes on: **6**
    (i)   Thread Libraries

       (ii)   IPC Systems

(i) Write short notes on: **6**
- (i)   Process Scheduling
- (ii)   Inter-Process Communication

(j) Write short notes on: **6**
- (i)   Atomic Transactions
- (ii)   Semaphores

(k) Write short notes on: **6**
- (i)   Critical section problem
- (ii)   Thread Scheduling

(l) Write short notes on: **6**
- (i)   Segmentation
- (ii)   Paging

(m) Write short notes on: **6**
- (i)   System Model
- (ii)   Page Table

(n) Write short notes on: **6**
- (i)   Thrashing
- (ii)   File Sharing

(o) Write short notes on: **6**
- (i)   File System Mounting
- (ii)   Allocating Kernel Memory

(p) Why demand paging is still being used in virtual memory management? What is the   **6** drawback with demand paying scheme.

(q) Consider the following reference string. Calculate the page fault rates for the FIFO and   **6** LRU algorithms. Assume that the memory size is 4-frames.
> **1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2**

(r) Write short notes on: **6**
- (i)   Thrashing
- (ii)   Paging

GROUP-B

Q-2 Distinguish between deadlock prevention and deadlock detection and recovery. Explain   **9** how they can be implemented in OS.

Q-3 Discuss various page replacement policies and evaluate them with respect to optimal   **9** replacement policy.

Q-4 What are the necessary conditions for deadlock? How can you prevent the occurrence of   **9** deadlock? Explain.

Q-5 Write short notes on: **9**
      (i)   Pre-emptive Vs. Non-pre-emptive Scheduling algorithm
      (ii)   Binary Vs. General Semaphores
      (iii)   Inter-process Communication

Q-6 What do you mean by Semaphores? How the P and V semaphores are used to ensure **9** mutual exclusion?

Q-7 Define critical section problem and characterize it. Write software solution for N-process **9** critical section problem and explain.

Q-8 Describe Round robin scheduling algorithm with an example. How is it differentiated from **9** SJF and FCFS?

Q-9 Write short notes on: **9**
      (i)   File-system Mounting
      (ii)   Demand Paging
      (iii)   Segmentation

Q-10 What are the key features of distributed operating system? What is the design issues **9** involved in distributed operating system? What is open source operating system?

Q-11 What is an Operating system? Illustrate evolution and structure of different operating **9** system. What are the different characteristics of Modern operating system?

Q-12 What do you mean by process scheduling? Discuss various activities performed in process **9** scheduling. State and explain performance measures of process scheduling algorithms.

What is meant by multithreaded programming? Describe different multithreading models.
Q-13 What are the threading issues in a multithreaded programming? **9**

Describe different Process Scheduling algorithms with examples.
Q-14 **9**

Describe different types of Synchronization with examples. What are the problems in
Q-15 Synchronization? **9**

What is deadlock? How a deadlock is detected? What are the different steps taken to
Q-16 recover from deadlock situation? **9**

Describe different Memory Management Strategies available in Operating System.
Q-17 **9**

What do you mean Demand paging? What is page fault? How the page fault frequency
Q-18 depends on the page size? **9**

Discuss various page replacement policies and evaluate them with respect to optimal
Q-19 replacement policy. **9**

<u>DATABASE MANAGEMENT SYSTEM</u>

GROUP – A

Q-1 (a) Describe different types of keys used in a database with examples. **6**

(b) Write short notes on: **6**
    (i)   Data Independence
    (ii)   Advantages and disadvantages in DBMS

(c) Draw and explain the three tier architecture of DBMS. **6**

(d) What is Relational Calculus? Describe different types of Relational Calculus with proper syntax and examples. **6**

(e) What is meant by database constraints? Describe different types of Integrity constraints with example. **6**

(f) Write short notes on: **6**
    (i)   Data dictionary
    (ii)   Database Manager

(g) Write short notes on: **6**
    (iii)   Data independence
    (i)   Database Administrator

(h) Write short notes on: **6**
    (i)   Join Operator
    (ii)   Projection Operator

(i) Write short notes on: **6**
    (i)   Tuple Relational Calculus
    (ii)   Database constraints

(j) Write short notes on: **6**
    (i)   Programming Techniques
    (ii)   View

(k) Write short notes on: **6**
    (i)   Queries
    (ii)   Relational Mapping

(l) Write short notes on: **6**
    (i)   Database design methodology
    (ii)   Relational Database Algorithm

(m) Write short notes on **6**
    (i)   Class Diagrams
    (ii)   Functional Dependencies

(n) Write short notes on: **6**
    (i)   Query Processing

        (ii)   Optimization

(o) Write short notes on: **6**
        (i)   Indexing Structure of Files
        (ii)   Tuning

(p) What is Index? Describe different types of Index used in database.   **6**

(q) Write short notes on:
        (i)   Functional Dependencies   **6**
        (ii)   Extended ER-Diagram

(r) Describe the terms View and Schema with example. What are the criteria for which a table   **6**
can be manipulated through views?

Group-B

Q-2 What is file management system? Discuss different types of file organizations with their   **9**
advantages and disadvantages.

Q-3 What is data model? Describe different types of data models with their advantages and   **9**
disadvantages.

Q-4 Write short notes on: **9**
        (i)   Mapping Cardinalities
        (ii)   Degree of Relationship
        (iii)   Types of attributes

Q-5 What is meant by database language? Explain different types of database languages with   **9**
examples.

Q-6 Describe different symbols used in an ER-Diagram. Draw an ER-Diagram for Banking   **9**
Enterprise.

Q-7 Write short notes on: **9**
        (i)   Types of Normalization
        (ii)   Query Languages
        (iii)   UML Diagrams

Q-8 What is Relational Algebra? What is the need of using JOIN operator in Relational   **9**
Algebra? Describe different JOIN-Operators with their syntax and examples.

Q-9 What is Hashing? How it related with the Index? Describe different types of Hashing used   **9**
in database.

Q-10 What is Hashing? What are the advantages and disadvantages of hashing addressing?   **9**
Discuss different hashing techniques in file organization.

Q-11 What is meant by normalization? Discuss various types of normalizations with examples. **9**

Q-12 What is file management system? Explain the different types of access mechanism used in a file system with their advantages and disadvantages. **9**

Q-13 What do you mean by functional dependency? State the Armstrong axioms for functional dependencies. How is it differentiated from multi value dependency? Give examples. **9**

Q-14 Describe the terms View and Schema with example. What are the criteria for which a table can be manipulated through views? **9**

Q-15 Create a table with name "STUDENT" having the following fields and add some records to it. **9**

Rollno, name, age, coursename.

Using this table solve the SQL queries.
    (i)   Display the names of the students whose age is above 18.
    (ii)   Display how many students are there in MCA course
    (iii)   Insert a record whose rollno is "R-20", name is "John", age is "17" and coursename is "MCA"
    (iv)   Change the age of student to 20 whose rollno is "R-35".

Q-16 Differentiate between Relational Calculus and Relational Algebra. Describe different operators used in Relational Algebra with examples. **9**

Consider the employee relational database, where the primary keys are underlined.
Employee (<u>person-name</u>, street, city)
Works(<u>person-name</u>, company-name, salary)
Company(<u>company-name</u>, city)
Manager(<u>person-name</u>, manager-name)

Q-17 Write the following queries in tuple relational calculus and domain relational calculus: **9**
    (i)   Find the names of all employees who works for First Bank Corporation.
    (ii)   Find the names, street address and cities of residence of all employees who work for the First Bank Corporation and earn more than Rs. 20,000 per month.
    (iii)   Find all employees who live in the same city and on same street as their managers.
    (iv)   Find all employees who do not work for First Bank Corporation.

Q-18 Design an ER-diagram for the airline reservation system consisting of flights, aircrafts, airports, fares, reservation tickets, pilot, crew, passengers. Clearly highlight the entities, relationships, the primary keys and mapping construct. **9**

Q-19 Sketch and explain the architecture of database system. **9**

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<u>DISCRETE STRUCTURES</u>

Q-1 (a)   (i)   State the converse, contrapositive and inverse of the conditional statement "If   **6** it snows tonight, then I will stay at home".

           (ii)   Show that if 3n +2 is an odd integer then n is odd(Use contraposition method).   **6**

(b)   (i)   Convert the logic statement into CNF form.   **6**
             P -> (Q -> R)

           (ii)   Show that $(p \wedge q) \to (p \vee q)$ is a tautology without using truth table.

(c)   (i)   Use set builder notation and logical equivalences to establish the De Morgan   **6** law $\overline{A \cap B} = \overline{A} \cap \overline{B}$.

           (ii)   Find out the domain and range of a relation
             R = { (x, y) / y = x+1, x∈A, y∈B }, where A ={1, 2, 3}, B= {3, 5, 6}

(d)   (i)   Let f and g be the functions from the set of integers to the set of integers defined   **6** by f(x) = 2x + 3 and g(x) = 3x +2. What is the composition of g and f ?

           (ii)   Describe the term partial-ordering with an example.

(e)   (i)   Convert $X + X\overline{Y}$ into canonical form.   **6**

           (ii)   What is meant by duality of a Boolean expression. Give example.

(f)   Write short notes on: **6**
           (i)   Logic gates
           (ii)   Homomorphism

(g)   Write short notes on: **6**
           (i)   The pigeonhole Principle
           (ii)   Binomial coefficients

(h)   What is closure of a Relation? Show that a = b mod 7 is an equivalent relation on Z.   **6**

(i)   Describe different Syntax and Semantic rules of First Order Predicate Logic (FOPL).   **6**

(j)   Using resolution to show that the hypothesis "Jashmin is Skiing or, it is not snowing" and   **6** "It is snowing or, Bart is playing Hockey" implies that "Jashmin is skiing or, Bart is playing Hockey".

(k)   What is Graph? Describe Adjacent, Incident and Path matrix- representation of a Graph   **6** with examples.

(l)   Draw Karnaugh map and simplify the Boolean function: **6**
Y(A, B, C, D)= ∑m (2, 3, 7, 8, 9, 11) + ∑d (0, 4, 5, 10, 14, 15)
Draw the Logic gates for the resulting function.

(m)   Describe the followings with examples: **6**
           (i)   Edge Vs. Vertex Graph Coloring
           (ii)   Conditional Vs. Discrete Probability

(n)   **6**

Describe the followings with examples:
  (i)   Euler Vs. Hamiltonian paths
  (ii)   CNF Vs. DNF Normal forms

(o)   **6**

Find a recurrence relation and give initial conditions for the number of bit strings of length n that do not have two consecutive 0s. How many such bit strings are there of length five?

(p)   (i)   How many Permutations of the letter AHKUNGHFD contains the string UNG?   **6**
       (ii)   What is the expansion of $(x + y)^5$?

(q) Write short notes on:
  (i)   Graph Coloring   **6**
  (ii)   Degree Sequence of a Graph

GROUP-B

Q-2 Describe different types of functions with examples. Let f: $R \rightarrow R$ and f(x) = 1 / x then show that f is bijection.   **9**

Q-3 What is mathematical induction? Use mathematical induction to show that   **9**
$$1 + 2 + 2^2 + \ldots\ldots\ldots + 2^n = 2^{n+1} -1$$

Q-4 Differentiate between Relation and Function. Describe different properties of Relation with examples. What is composition of Relation?   **9**

Q-5 Describe difference inference rules in propositional logic. Check the validity of each rule using truth table.   **9**

Q-6 Differentiate between Group, Semi-Group, Monoids and Abelian Group. Let A = {0, 1, 2, 3, 4, 5} and * be the operation addition modulo 6. Show that (A, *) is a group.   **9**

Q-7 Draw Karnaugh map and simplify the Boolean function: **9**
Y(A, B, C, D)= $\sum m$ (1, 2, 3, 7, 8, 9, 11, 12 + $\sum d$ (0, 4, 14, 15)

Q-8 Write and explain Baye's theorem with an example.

  9

Q-9 What is the principle of inclusion-exclusion?
Suppose that there are 1807 freshmen at your school. Of these, 453 are taking a course in   **9** computer science, 567 are taking a course in mathematics, and 299 are taking courses in both computer science and mathematics. How many are not taking a course either in computer science or in mathematics?

Q-10 Describe Set, Adjacency Matrix, Incident Matrix and Path Matrix Representation of Graph with examples.   **9**

Q-11 Use Dijkstra's algorithm to find the length of shortest path between the vertices a and f in the given weighted graph.   **9**
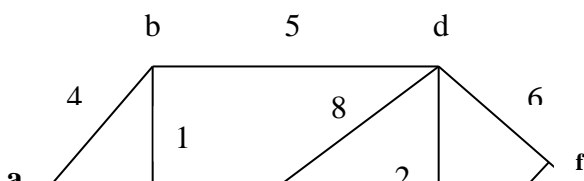
Q-12 Describe difference inference rules present in Propositional Logic. Check the validity of   **9**
each rule using truth table.

Q-13 Differentiate between function and relation with examples. Prove that a function F: R→R,   **9**
and f(x) = 1 / x, is bijection.

Q-14 Answer the followings: **9**
      (i)   Convert $\overline{XY} + X\overline{Z}$ in to canonical form.
      (ii)   Prove that $\overline{(A \cup B)} = \overline{A} \cap \overline{B}$ using set builders notations.
      (iii) Show that if n is an integer and n^3+3 is an odd then n is even   using contra-
      positive method.

Q-15
Define the terms Algebraic Structure, Semigroup, Monoid, Group and Abelian Group.
Let G = {1, 3, 5, 7} any set then show that (G, *) is a an Abelian group. (where $* = \times_8 =$ **9**
Multiplication Modulo 8)

Q-16 Write and explain Baye's theorem with an example.   **9**

Q-17 Answer the followings:
      (i)   What is the coefficient of $x^{12}y^{13}$ in the expansion of $(2x-3y)^{25}$?   **9**
      (ii)   Let f(x)= x+2, g(x) = 2x. Find fog(x) and gof(x).
      (iii) Find out the probability of getting exactly 1 head by tossing a coin twice.

Q-18 Answer the followings:
      (i) Show that $\mathbf{n^3 - n}$ is divisible by 3 for all positive integer by the method of induction.   **9**
      (ii)   Define the following graphs with examples.
         Weighted Graph, Complete Graph, Cyclic Graph, and Connected Graph,

Describe the followings with examples:
Q-19   (iii)   The pigeonhole Principle   **9**
        (iv)   Structural Induction
        (v)   Graph Models

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Forth Semester

➢ JAVA PROGRAMMING
➢ COMPUTER NETWORK
➢ COMPUTER GRAPHICS

JAVA PROGRAMMING

GROUP-A

Q-1(a) How do we use design a package? How do we add a class or, an interface to a package? **6**

(b) How polymorphism can be achieved through methods? Discuss method overloading with a suitable example. **6**

(c) Describe various control statements available in JAVA with example. **6**

(d) Write short notes on: **6**
    (i)   Class Variables
    (ii)   Garbage Collection
    (iii) JAVA Servlets

(e) Write a program in JAVA to input a number and check prime or not. **6**

(f) Describe different types of Inheritance available in JAVA with suitable diagrams. **6**

(g) What is the main function of "final" keyword? Explain the use of final-keyword in a method with an example. **6**

(h) Write short notes on: **6**
    (i)   AWT Controls
    (ii)   Type Conversion
    (iii) JAVA Strings

Group-B

Q-2 How is method defined? When do we declare a method or, class abstract? Discuss the different levels of access protection available in JAVA. **9**

Q-3 How exceptions are handled in JAVA? What will happen if you will not handle exceptions in your program? Explain with example. **9**

Q-4 What is Interface in JAVA? Whether an Interface can inherit another Interface? If yes then give an example to show how can it be achieved? **9**

20

Q-5 What is a thread? Describe the complete life cycle of a thread.   **9**

Q-6 What is an Applet? Draw and explain the life cycle of an applet.   **9**

Q-7 Write short notes on: **9**
         (i)   Swing components of JAVA
         (ii)   Method Overriding
         (iii)   Wrapper Classes

Q-8 What is meant by token? Describe various tokens available in JAVA with example.   **9**

Q-9 Describe the concept of Multithreading with an example.   **9**

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COMPUTER NETWORK

GROUP-A

Q-1(a) Explain the principle of encoding, when the data is digital and signal is analog.   **6**

(b) What is meant by switching? Describe different switching techniques in a network.   **6**

(c) What is meant by addressing? Describe different addressing schemes available in communication networks.   **6**

(d) Write short notes on: **6**
         (i)   Virtual LANs
         (ii)   Checksum
         (iii)   Protocols

(e) Explain in details the architecture of IEEE 802.   **6**

(f) Write short notes on: **6**
         (i)   ATM
         (ii)   Block Coding
         (iii)   Data Rate Limits

(g) Draw and explain the architecture of TCP/IP Protocol.   **6**

(h) Draw and explain the architecture of SONET.   **6**

Q-2 What is meant by multiplexing? Describe different types of multiplexing techniques in a network. **9**

Q-3 Why does on require Error Control for data transmission? Describe CRC method of error detection in a communication link. **9**

Q-4 Write short notes on: **9**
    (i)   Transmission Modes
    (ii)   Framing
    (iii)   Ethernet

Q-5 What is meant by Transmission Media? Describe different types of guided and unguided Media available in the data Transmission. **9**

Q-6 Write short notes on: **9**
    (i)   Channelization
    (ii)   Digital Subscriber Line
    (iii)   Virtual Circuit Networks

Q-7 Draw and explain different layers of OSI. How is it differentiated from TCP/IP. **9**

Q-8 Describe different Transmissions Impairments available in the Data communication networks. **9**

Q-9 Describe different types of digital transmissions available in data communication with diagrams. **9**

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COMPUTER GRAPHICS

GROUP-A

Q-1(a) Translate a square ABCD with the coordinates A(1, 1), B(5, 1),   C(5, 5), D(1, 5) by 2-units in x-direction and 3-units in y-direction. **6**

(b) Write short notes on: **6**
  (i)   Composite Transformation
  (ii)   Components of Computer Graphics
  (iii) Graphical Input Devices

(c) What is meant by Animation? Discuss various types of Animations. **6**

(d) Discuss the Z-buffer method for visible surface detection. **6**

(e) Write short notes on: **6**
  (i)   Orthogonal Vs. Oblique Projection
  (ii)   Bezier Vs. B-Spline Curves
  (iii) Line Vs. Polygon Clipping

(f) What is meant by Illumination Models? Describe any two Illumination Models. **6**

(g) Describe different Polygon-Rendering Methods. **6**

(h) What is meant by Computer Graphics? Discuss the working principle of raster scan system. **6**

Group-B

Q-2 Write down the Bresenham's circle draw algorithm. Draw a circle of radius 6 using this algorithm. **9**

Q-3 Write down the Sutherland Hudgeman polygon clipping Algorithm. Clip the polygon against the window R by using this algorithm. **9**
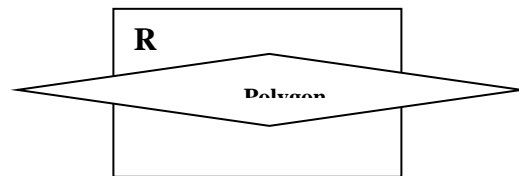
Q-4 Explain with examples control points, Blending function used in Bezier curve. Describe the procedure for drawing the Bezier curve passing through four control points. **9**

Q-5 Distinguish between parallel and perspective projections. Develop the matrix transformation for perspective projection. **9**

Q-6 Differentiate between Geometric and Coordinate Transformation? Discuss the Translation and Scaling transformations in 3D. Justify the use of homogeneous Co-ordinate system in this representation. **9**

Q-7 Write short notes on: **9**
      (i)   Antialiasing
      (ii)   Visible surface detection methods
      (iii)   Dithering Techniques

Q-8 Distinguish between Clipping & Zooming. Write and explain the Cohen-Sutherland two **9**
dimensional line clipping algorithm.

Q-9 Write short notes on: **9**
      (i)   BSP Trees
      (ii)   Ray-Casting Method
      (iii)   Hierarchical Modeling

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Fifth Semester

➤ INTERNET TECHNOLOGY
➤ SOFTWRE ENGINEERING
➤ INFORMATION SECURITY
➤ MICROPROCESSOR

INTERNET TECHNOLOGY

GROUP-A

Q-1(a) Describe different conditional statements available in JavaScript with examples. **6**

(b) Differentiate between JDBC API and JDBC Driver API. Write a program in JDBC to **6**
retrieve Name, Age and Address of all the students from the STUDENT database.

(c) Describe different steps to connect JAVA application program with the database. Give an **6**
example.

(d) Describe different data types in JavaScript with examples. **6**

(e) Write short notes on: **6**
      (i)   Operators in JavaScript
      (ii)   JSP Environment

(f) What are the different characteristics of JavaBeans? How the JavaBeans class is differentiated from other class? What are the different steps to connect the database with JavaBeans? **6**

(g) Write short notes on: **6**
    (i)   Resultset Objects
    (ii)   JavaScript events

(h) Differentiate between JSP expression, JSP Scriplet, and JSP declaration with examples. Write a JSP code to find out maximum of three numbers. **6**

GROUP-B

Q-2 How can an object be created from a class? Describe different methods to initialize an object in JAVA. Give example to each initialization methods. **9**

Q-3 Differentiate between User-defined and built-in function in JavaScript with examples. Write a program in JavaScript to check an input string PALINDROME or not. **9**

Q-4 What is meant by implicit object? Describe different Implicit objects in JSP. **9**

Q-5 What are the different special operators available in JavaScript? Write a program in JavaScript to swap two numbers without using third variable and without using any arithmetic operator. **9**

Q-6 Write short notes on: **9**
    (i)   Statements in JDBC
    (ii)   Scope of variable
    (iii)   Introspection

Q-7 Draw and Explain different JDBC drivers with their advantages and disadvantages. **9**

Q-8 Write short notes on:
    (i)   Error Handling and Debugging in JSP **9**
    (ii)   JAR files
    (iii)   JAVA Servlets

Q-9 Draw and explain the detailed Life cycle of JSP. **9**

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SOFTWRE ENGINEERING

GROUP-A

Q-1(a) What is requirement engineering? Describe different steps for requirement engineering processes. **6**

(b) Write short notes on: **6**
  (i) Architectural Views
  (ii) Software Requirements

(c) Briefly explain the extreme programming (XP) SDLC model. Identify the key principles that need to be practiced to the extreme in XP. **6**

(d) Write short notes on: **6**
  (i) Dependability Engineering
  (ii) Characteristics of good SRS

(e) Discuss the process models for software maintenance and indicate how you would select an appropriate maintenance model for a maintenance project at hand. **6**

(f) What are the principal factors that affect the costs of system re-engineering? **6**

(g) Explain how the complementary strategies of resistance, recognition and recovery may be used to enhance the survivability of a system. **6**

(h) Discuss different symbols used in UML with examples. **6**

GROUP-B

Q-2 Differentiate between Black-box testing and White-box testing? Discuss in details about different levels of testing. **9**

Q-3 Briefly describe the RAD-SDLC model. Compare RAD model with Prototyping, Iterative-Waterfall and Evolutionary Model. **9**

Q-4 Write short notes on:
  (i) Advantages and Disadvantages of Prototyping Model **9**
  (ii) Software Project Management
  (iii) Software Maintenance

Q-5 Differentiate between Software Model and System Model. Describe in details about different System models. **9**

Q-6 Write short notes on: **9**
  (i) Software Reverse Engineering
  (ii) System Engineering
  (iii) System survivability

Q-7 What is security risk management? Explain why there is a need for both preliminary risk assessment and life cycle risk assessment during development of a system. **9**

Q-8 Discuss how the reliability changes over the lifetime of a software product. Describe the term Reliability-specification and how is it differentiated from formal specification? **9**

Q-9 Discuss in details the architecture of Dependable Systems. What are Dependable **9**
processes?

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INFORMATION SECURITY

GROUP-A

Q-1(a) What is meant by Computer Security? Describe different factors used in Computer **6**
Security.

(b) What is DES? Describe different modes of DES with diagrams. **6**

(c) Discuss different security methods in Operating System. **6**

(d) Write short notes on: **6**
      (i)   Non Malicious Program Errors
      (ii)   Message Digest

(e) Write short notes on: **6**
      (i)   Digital Certificate
      (i)   Treats in Networks

(f) What is meant by sensitive data? Discuss several factors can make the data sensitive. **6**

(g) What is Risk Analysis? Describe different steps of a Risk analysis. **6**

(h) Explain the concept of Digital Signature with diagrammatic representations. **6**

GROUP-B

Q-2 List the major security issues dealt with at each level of the OSI protocol stack. **9**

Q-3 Write and explain the Diffie-Helmann-procedure in cryptosystem with an example. **9**

Q-4 What is Firewall? Explain different types of Firewalls with examples.

9

Q-5 Write short notes on:

(i)	Salami Attacks		**9**
(ii)	Inference		
(iii)	File Protection Mechanisms		

Q-6 Write short notes on: **9**
    (i)   Physical Security
    (ii)   Security in Database
    (iii)   Covert Channels

Q-7 What is security policy? What are the characteristics of good security policies? Discuss different types of security policies with example. **9**

Q-8 What is meant by Memory and address protection? Discuss different methods to protect Memory. **9**

Q-9 Discuss different ethical issues in Security. **9**

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<u>MICROPROCESSOR</u>

<u>GROUP-A</u>

Q-1(a) Write and explain different steps in a pipelining concept. What are the disadvantages of pipelining? **6**

(b) Draw and explain different components of ARM Programmer's Model. **6**

(c) Describe different data processing instructions in ARM with examples. **6**

(d) Write short notes on: **6**
    (i)   Processor design trade-offs
    (ii)   RISC Vs. CISC **6**

(e) Describe different data transfer instructions in ARM with examples. **6**

(f) Write short notes on: **6**
    (i)   Thumb Applications
    (ii)   Abstraction in Software design

(g) Describe in details about AMBA (Advanced Microcontroller Bus Architecture). **6**

(h) What is meant by Instruction set design? What are the different types of Instruction sets? Describe different types of modes to operate an Instruction in ARM.   **6**

GROUP-B

Q-2 What is RISC? Draw and explain the architecture of RISC. Write down the disadvantages if it.   **9**

Q-3 Describe different addressing techniques in ARM with examples.   **9**

Q-4 Draw and explain different components of MU0 microprocessor.   **9**

Q-5 Explain the architecture of ARM-floating point with diagrammatic representations.   **9**

Q-6 Write short notes on:
      (i)   ARMulator   **9**
      (ii)   Breakpoint Instruction
      (iii)   Thumb data processing Instruction

Q-7 Draw and explain the architecture of 3-stage pipeline ARM processor. Write down the observations found in this ARM Processor.   **9**

Q-8 Write short notes on: **9**
      (i)   ARM8-A Vs. ARM8-R
      (ii)   Hardware system prototyping tools
      (iii)   Software Interrupt

Q-9 Discuss in details about different development tools in ARM.   **9**

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Sixth Semester

➢ **ARTIFICIAL INTELLIGENCE**

➢ DESIGN AND ANALYSIS OF ALGORITHMS
➢ CLOUD COMPUTING

<u>ARTIFICIAL INTELLIGENCE</u>

<u>GROUP-A</u>

Q-1(a) Suppose you are given 3 jugs of capacities 8, 5, 3 liters respectively but none of them are calibrated. The first jug filled with milk. By the method of pouring back and forth among the three jugs, divide the 8 liters in to two equal parts. **6**

(b) Differentiate between script and frame. Create an instantiated person frame for an individual Rakesh who is 60 years old doctor, lives in Baripada, Odisha with his wife Neha and two children Aman and Aryan. **6**

(c) Differentiate between CNF and DNF. Translate the following into Disjunctive Normal Form and Conjunctive Normal Form. **6**

$$\sim (X \rightarrow Y) \rightarrow Z$$

(d) Write short notes on: **6**
    (i)   Neural Networks
    (ii)   Logical Agent
    (iii)   Machine Translation

(e) Express the following statement as a conceptual graph: **6**
"Mohan takes soup with a spoon at Romi- restaurant"

(f) Write down the syntax and semantics of FOPL. **6**

(g) Differentiate between informed and non-informed search techniques. Write the procedure for A* search technique. **6**

(h) Write short notes on: **6**
    (i)   Decision Trees
    (ii)   Knowledge Representation
    (iii)   Adversarial Search

<u>Group-B</u>

Q-2 Determine the starting state, goal state, and legal moves and draw the state space for the well-known missionaries cannibal problem, listed below: **9**

There are three missionaries, three cannibals and a boat on the left bank of a river. All the six persons to be transported to the right hand bank using a boat. The boat carries only two persons at least one person should bring back the boat. If the cannibals outnumber the missionaries on either side of the bank, they will eat the missionaries.

Q-3   **9**

Given the following information for a database.
- (i)   If x is on the top of y, y supports x.
- (ii)   If x is above y and they are touching each other, x is on the top of y.
- (iii)   A cup is above a book.
- (iv)   A cup is touching a book

Using Resolution Principle to show that SUPPORTS(book, cup) is true.

Q-4   **9**

Compare and contrast between Conventional system and Expert system. Explain the detailed rule based architecture of an expert system.

Q-5   **9**

What is meant by Natural Language Processing? Parse the sentence through ATN.
     "The book is kept on the table"

Q-6(a)   **5**

Differentiate between Top-down and Bottom-up Parsing techniques. Parse the sentence in bottom up parsing.
     "The big tree shades the old house by the stream**"**

(b)   **4**

Convert the following sentences in to FOPL
- **(i)**   Everybody likes somebody.
- **(ii)**   Every even number is divisible by 2.

Q-7   **9**

Write short notes on:
- (i)   Syntactic Analysis
- (ii)   Planning Graphs
- (iii)   Reasoning

Q-8   **9**

What is Planning? What are the different components of Planning? Describe different types of Planning.

Q-9   **9**

What are the components of a Script? Write a Script on Restaurant.

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DESIGN AND ANALYSIS OF ALGORITHMS

GROUP-A

Q-1(a) Show that RANDOMIZED-QUICK-SORT's expected running time is $\Omega(n \log n)$. **6**

(b) Define the Greedy Method with an example. **6**

(c) What is meant by Dynamic programming? Explain it with a suitable example. **6**

(d) Define NP-Complete problem with an example. **6**

(e) Show the step-by-step process of operation in following set of data using quick sort. **6**
15, 44, 88, 11, 66, 94, 2, 18, 55, 68

(f) Write short notes on: **6**
    (i)   Cycle Matching
    (ii)   Redblack Tree
    (iii)   Computational Geometry

(g) Discuss different asymptotic functions and notations used in an algorithm. **6**

(h) Write short notes on: **6**
    (i)   Fractional Knapsack
    (ii)   Graph Coloring
    (iii)   Maxflow Matching

Group-B

Q-2 Explain the process of heap sort. Write an algorithm to construct a min heap. What is time complexity of the sorting process? **9**

Q-3 Describe and justify Prim's algorithm for finding the minimum spanning tree of an undirected graph. Find out the time complexity of it. **9**

Q-4 Write and explain Dijkstra's algorithm for shortest paths with an example. **9**

Q-5 Design a divide and conquer algorithm for finding the minimum and the maximum element of n numbers using no more than 3n/2 comparisons. **9**

Q-6 Describe and justify Kruskal's algorithm for finding the minimal spanning tree of an undirected graph. What is the time complexity of it? **9**

Q-7 What is approximation ratio? Write the algorithm of a vertex-cover problem. **9**

Q-8 Explain and solve travelling salesman problem with triangle inequality. **9**

Q-9 What are the four factors that decide the efficiency of the Backtracking Algorithm? Define and explain 4-queens problems using backtracking. **9**

CLOUD COMPUTING

GROUP-A

Q-1(a) What is cloud computing? Discuss about the Pros and Cons of cloud computing. **6**

(b) Explain the activities on cloud computing for the corporation. **6**

(c) Draw and explain Microsoft Windows Azure. **6**

(d) Discuss different barriers of cloud computing. **6**

(e) List and explain various cloud computing security issues. **6**

(f) Draw a neat sketch of Google cloud platform and explain. **6**

(g) How does cloud computing help to reduce the times to market applications and to cut down capital expenses? **6**

(h) Draw and explain Amazon cloud computing infrastructure. **6**

Group-B

Q-2 Explain the architecture of cloud computing in detail. **9**

Q-3 Write short notes on:
    (i)   Grid computing **9**
    (ii)   Distributed Computing
    (iii) Cluster Computing

Q-4 Explain the types of cloud service development in details. **9**

Q-5 Write a brief notes on cloud security design principle. **9**

Q-6 Explain in detail about understanding the cloud storage. **9**

Q-7 State and explain service models of cloud computing with architecture. **9**

Q-8 Write short notes on:

      (i)   Economics of Scaling   **9**

      (ii)   Platform as a Service

      (iii)   Community Cloud

Q-9(a) What is Hadoop? Explain the architecture of Hadoop in detail.   **6**

  (b) Write a notes on History of cloud computing.   **3**

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