Q.1  a) What is Von-Newmann model of computer? Discuss its features.
b) Write short note on Register Transfer Language.

OR

What is the function of the following in computer system?
 a) Accumulator
 b) Program Counter
 c) Memory Address Register
 d) Instruction register
 e) Memory Data Register

Q.2  a) Discuss in brief micro program control unit and hardwired control unit.
b) Formulate a mapping procedure that provides eight consecutive microinstruction for each routine. The operation code has six bits and the control memory has 2048 words.

OR

Explain various branching techniques in micro programmed control unit

Q.3  a) Explain Booth multiplication algorithm and its hardware.
b) Represent the number (+46.5)_{10} as a floating point binary number with 24 bits. The normalized fraction mantissa has 16 bits and exponent has 8 bits.

OR

a) Design an array multiplier that multiplies two 4 bit numbers. Use AND gates and binary address.
b) Explain how BCD addition is carried out in a 4-bit BCD adder.

Q.4  a) Explain programmed I/O and interrupt initiated I/O.
b) How many characters per second can be transmitted over a 4800 baud line in of the following nodes?(Assume character code of 8 bits).
   i) Synchronous serial transmission
   ii) Asynchronous serial transmission with two stop bits.
   iii) Asynchronous serial transmission with one stop bit.

OR

a) What do you mean by synchronous and asynchronous data transfer? Explain
handshaking method asynchronous data transfer.

b) What is a DMA controller? Explain.

Q.5

a) Write short note on array processor.
b) What do you mean by pipeline? Explain pipeline conflicts.

OR

a) Compare I/O versus memory bus.
b) How many memory-chips of (128*8) are needed to provide a memory capacity of 4096*16.
CS-402

Model Test Paper -II

Computer System Organization

Time: 3 Hours
MM: 100

Note: 1. Attempt any five questions. Each question carries equal marks.

Q.1 a) What is the difference between a direct and an indirect address instruction? How many references to memory are needed for each type of instruction to bring an operand into a processor register? Give at least each type of instruction of each type.

b) What must be the address field of an indexed addressing mode instruction to make it the same as a register indirect mode instruction?

OR

a) Explain 8085 microprocessor.
b) Explain implicit and register addressing mode with example.

Q.2 a) Define the following:
(i) Micro operation
(ii) Micro instruction
(iii) Micro program
(iv) Micro instruction

b) Write short note on microprogramming.

OR

a) With neat block diagram, explain working principal of microprogram sequencer.
b) Show how a 9-bit micro-operation field in microinstruction can be divided into subfields to specify 46 micro-operation. How many micro-operations can be specified in one micro instruction?

Q.3 a) Multiply (-6)*(2) using Booth multiplication algorithm.
b) Draw the flowchart and explain how division of two fixed point binary numbers in sign-magnitude representation is carried out?

OR

a) Explain in short with the help of flowchart how the addition and subtraction is carried out of floating point numbers.

Q.4 a) What is the need of virtual memory in computer system? Explain how the page map table is organized in virtual memory system.
b) What do you mean by serial transmission and parallel transmission of data.
Compare them.

**OR**

**a)** What is the difference between Subroutine and Interrupt Service Routine.  
**b)** Write an assembly program to obtain the multiplication table of 12 using repeated addition.

**Q.5** What is an interconnection network? Explain different types of interconnection network.  

**OR**

Prove that a K-stage linear pipeline can be at most K-times faster than that of Non-pipelined serial processor.
Subject Code CS-403

Model Test Paper -I

Subject Name - Object Oriented Technology

Time: 3 Hours                                                                                                         MM: 100

Note: 1. Attempt all questions. Each question carries equal marks.

Q.1 a) What is dynamic binding? How is it useful in OOP?
  b) What are objects? How messages are passed to objects? Also explain how object
     are used
     as software module?

   OR

   a) What is the difference between an ADT and object class? How can you
     implement an
     ADT as object class? Give example.
   b) Explain the significance of data hiding with suitable example.
   c) Explain the meaning of hierarchies of class with example.

Q.2 a) Explain about association between objects by giving proper example & also
     explain many
     to many association by giving a suitable example.
   b) What are class diagram & the purpose of class diagram? Describe the icons used
     for class
     relationship.

   OR

   a) What is the meaning of aggregate components of object with example? Discuss
     Aggregation vs. Generalization.
   b) Draw an object diagram to capture the interaction between students and teacher
     for courses as per given time-table. You are advised to choose descriptive self-
     explanatory class, attribute & association names.

Q.3 a) What is disinheritance? What is software “peter principle”?
  b) Write a C++ program to illustrate destructor in multiple inheritance.

   OR

   Suppose that we have a class called FATHER and a class MOTHER. Say that we
   have a
   class CHILD which is inheriting from both FATHER and MOTHER class. Say that
   FATHER has qualities Q1, Q2 & Q3 and MOTHER has qualities Q1, Q2 & Q4.
   i) Draw diagram for this situation.
   ii) Is it example of multiple inheritances?
   iii) Give qualities of CHILD due to inheritance along with its explanation.
Q.4 a) Write a C++ program to add two distances entered in feet & inches and store the result in third distance. Pass two distances as argument to a function and the function should return the added distance. Use required constructors and methods in your program.

b) What is data persistence?

OR

a) What is the importance of copy constructor? Under which circumstances explicit definition of copy constructor is necessary? Explain by proper example.
b) What is message passing? What are the different forms of message passing?

Q.5 a) When do we need to include storage.h file in our C++ program?
b) Write a short note on: I/O stream & templates.

OR

Write a program using class pointer to read 20 strings each containing maximum 20 characters. Write a member function that arranges these in alphabetical order and print the alphabetically arranged list.
Q.1 a) How Object Oriented Programming differs from object based programming? Explain object as a software module.
   b) With the help of a C++ program explain what is friend function? Write down the restrictions, advantages & disadvantages of friend function.

   **OR**

   a) What is the difference between static & dynamic object? What are the benefits of reusability? How is it Useful?
   b) Create a class Length. Create L1, L2 & L3 as object of class Length. Write a C++ program to read length L1 & L2 as meter & centimeter respectively. Take meter & centimeter as integer. Add these length L1 & L2 and then store result in L3 and display it.

Q.2 a) What are the constructors? What are the different types of constructors? Explain it with the help of C++ program.
   b) What is association? Give syntax structure of various associations.

   **OR**

   a) Why Data members and member function are declared as static in any class? Explain by giving proper example.
   b) Prepare a Data Flow Diagram for computing the volume & the surface area of a cylinder. Inputs are the height & radius of a cylinder. Outputs are volume & surface area.

Q.3 a) How can base class protect derived classes so that any changes to be base class will not affect them?
   b) What are access control specifiers? Explain the role of it & in what respect protected & private data member are different?

   **OR**

   a) What is meant by overriding member functions? Give proper example to explain the concept.
   b) What is polymorphism & explain different types of polymorphism?
Q. 4 a) What is object pointer? How to declare the object pointer & access it by using object?
   b) What is this pointer? Give the most practical use of it. Is there any difference between
   object pointer & this pointer?

   OR

a) Write a C++ program to explain how an object can be returned from a function.
   b) What is by default argument in C++? Write a small C++ program to demonstrate
   its use.

Q. 5 a) What are differences & similarities between C and C++ ?
   b) Explain how memory allocation failure can be handled in C++ ?
   c) What is file mode? Describe the file mode options are available.

   OR

a) Creates a class string to accept a string whose length is not known. Accept and
   display
   the string using extractor and insertor functions.
   b) What are the stream classes? What are the advantages of stream classes?
CS 404
Model Test Paper -I
Analysis & Design of Algorithm

Time: 3 Hours
MM: 100

Note: 1. Attempt all questions. Each question carries equal marks.

1. a) Strassen’s matrix multiplication?
   
   b) Write the algorithm of quick sort?

   Or

   a) Explain technique use in binary search with example?
   b) Illustrate the operation of Max-Heapify on the array:
      
      A = (45, 25, 61, 7, 84, 21, 64, 36, 75, 12)

2. a) Find the optimal merge pattern for the following data:

      28, 30, 12, 56, 24, 28, 55, 62, 5, 41

   b) Explain Greedy algorithm for knapsack problem?

   Or

   a) Explain Greedy algorithm for constructing a Huffman code?
   b) Explain prim’s algorithm?

3. a) What is Dynamic programming? How does the dynamic programming differ from 
   Greedy algorithm?
   
   b) Find the all pair shortest path using Floyd Marshall algorithm for given graph.

   Write short note
   • Reliability design
   • 0/1 knapsack
4. a) Explain 4 queen’s problem using Backtracking?
   b) Define how knapsack problem is solved by dynamic programming, consider n=4
       \((w_1, w_2, w_3, w_4) = (1,3,3,2,2), (P_1, P_2, P_3, P_4) = (3,2,4,3)\) and \(m=8\). Find optimal solution?

   Or

   a) Explain Branch & Bound method with proper example?
   b) Write short note on:
      - Hamiltonian cycle
      - Graph coloring problem

5. a) What is spanning tree? Write its type?
   b) Find the DFS of the following graph

   Or

   a) What is binary search tree and it traversal?
   b) Apply Kruskal’s algorithm to find minimum spanning tree for graph?
CS 404
Model Test Paper -II
Analysis & Design of Algorithm

Time: 3 Hours
MM: 100

Note: 1. Attempt all questions. Each question carries equal marks.

1. a) Use the heap sort for sorting the array 56,24,76,13,59,84,69,42,14,37
   b) Write the algorithm of binary search?

   Or
   a) Find the Asymptotic notation for the function:
      \( f(n) = 5n^3 + n^2 + 9n + 8 \)
   b) Explain heap algorithm with example?

2. a) Find an optimal solution to the knapsack instance \( n=7 \), capacity \( m=15 \) where profit
   \( (P_1, P_2, P_3, \ldots, P_7) = (10, 5, 15, 7, 6, 18, 3) \) and weight \( (w_1, w_2, w_3, \ldots, w_7) = (2, 3, 5, 7, 1, 4, 1) \).
   Find its fraction solution?
   b) Explain multi stage graph?

   Or
   a) Write the algorithm for single source shortest path?
   b) Explain job sequencing with deadline?

3. a) Consider the following multi state graph, Calculate the shortest path of the given graph?
b) Explain the Floyd Marshall algorithm with example?

Write short note
- Floyd-warshall algorithm
- Hamiltonian cycle

4. a) Explain Backtracking with some example?
    b) Explain lower bound theory?

Write short note
- Branch & bound method
- Travelling salesman problem

5. a) Create a B-tree of order 5 from the following list of data items: 20, 30, 45, 25, 16, 80, 9, 46, 35, 85, 69, 47, 38, 50
    b) What is NP-complete and NP-Hard?

a) What is B-tree? Explain it?
    b) Insert these key into a AVL tree
    45, 68, 74, 12, 56, 84, 42, 94, 65, 48, 23