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

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.
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) Microinstruction
       (iii) Micro program
       (iv) Microinstruction
   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.
IT 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.
   ![Graph Diagram]
   Or
   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?
IT 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?

Or

Write short note

- Floyd-warshall algorithm
- Hamiltonian cycle

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

Or

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, 47, 38, 50
   b) What is NP-complete and NP-Hard?

Or

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