Time: 3 hours   Full marks: 70

Use separate answer script for each part
First Half
(Answer question No 4 and any two from the rest)

1. a) Design a hardware control unit that can generate control signal to compute the GCD of two numbers.
   b) Write assembly language program to implement
   X=(A+B)*(C+D) in computers having
   i) general register organization with three address instructions
   ii) general register organization with two address instructions
   iii) single accumulator organization
   iv) stack organization   7+8=15

2. a) Discuss the significance of the following logic micro operations:
   i) selective set
   ii) selective complement
   iii) selective clear
   iv) mask
   v) insert
   b) Differentiate between logical shift, circular shift and arithmetic shift.   10+5=15

3. a) Briefly discuss the operation of full CMOS SRAM cell.
   b) How a 4k x 8 RAM can be made from 1k x 8 RAM?
   c) Discuss direct cache memory mapping technique.
   d) What is the disadvantage of the above technique?   4+4+4+3=15

4. Write short note on (any one)
   a) Set associative mapping
   b) Binary adder-subtractor

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Second Half
(Answer question No 5 and any two from the rest)

5. Answer Any Three of the followings   (3X5)
   a) Construct an AVL tree by inserting the following elements:
      G, H, S, L, E, M, T, U
   b) Describe Quick sort algorithm with an example.
   c) Describe Quadratic Probing and Chaining for Collision Resolution
   d) Define BST and B-tree with proper example.
   e) Build a Heap from the following numbers:
      44, 30, 50, 22, 60, 55, 77, 58.
   f) Explain Hashing, Hash table and Hash function.

6. a) Explain the structure of a two-way list.
   b) Write an algorithm to insert a given ITEM of information between adjacent nodes A and B in a two-way list.
   c) How the given polynomial is represented by linked list?
      $p(x) = 4x^3+6x^2+10x+6.$ (3+4+3)

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7. a) How a stack is represented using a singly linked list?
   b) Write algorithms for PUSH and POP operation for the above stack.
   c) Convert the following infix expression into postfix notation
      5*(6+2)-12/4   (2+6+2)

8. a) How a queue is represented using an array?
   b) Write algorithms to insert an element into and to delete an element from the above queue.
   c) What do you mean by DEQUEUE?   (2+6+2)

9. a) Define complete binary tree with example.
   b) Inorder and Postorder traversals of tree T are as follows:
      Inorder: D B F E A G C L JH K
      Postorder   D F E B G L J K H C A
      Draw the tree.
   c) Explain two-way inorder threading with diagram.   (2+5+3)