

**C0-R4.B4 : COMPUTER SYSTEM ARCHITECTURE****NOTE :**

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

**Total Time : 3 Hours****Total Marks : 100**

1. (a) What is tri-state buffer ? Draw a bus line using three state-buffers for four register A, B, C and D having 4 bits each.
  - (b) Represent the following conditional statement by two register transfer statement with control functions. If (P=1) then (R1←R2) else if (Q=1) then (R1←R3). Also draw the hardware to transfer data from register R1 to register R2 when P=1
  - (c) Using 8-bit 2's complement representation of negative numbers, perform the following computation:  $(-35)_{10} + (-11)_{10}$
  - (d) What is Priority Interrupt ? Explain Daisy-Chaining Priority Interrupt.
  - (e) Explain instruction cycle in CPU with a four-segment pipeline using flow diagram.
  - (f) Explain the following terms (any two)
    - (i) Locality of reference
    - (ii) Subroutines
    - (iii) Associative memory
    - (iv) Serial communication
  - (g) What is strobe and handshaking in asynchronous data transfer ? (7x4)
2. (a) Explain three different types of shift Micro operations. Apply those microoperation with an initial value of R=11011100. Determine the value of R after Logical Shift Left, followed by Circular Shift Right, followed by Logical Shift Right and Circular Shift Left.
  - (b) Draw the timing diagram assuming that SC is cleared to 0 at the time T3 if control signal C7 is active i.e.  $C7T3 : SC \rightarrow 0$  (C7 is activated with the positive clock transition associated with T1.)
  - (c) Explain interrupt cycle with the help of flowchart. (6+4+8)
3. (a) Explain subtraction of unsigned binary numbers using 2's complement method.
  - (b) Explain the following instructions with help of some example
    - (i) Three-Address Instructions
    - (ii) Two-Address Instructions
    - (iii) One-Address Instructions
    - (iv) Zero-Address Instructions
  - (c) Explain various types of Addressing modes used to design general purpose computer. (4+6+8)

4. (a) Explain different types of hazards and dependencies in pipeline processors.  
 (b) The nonpipeline system takes 50ns to process a task. The same task can be processed in a six- segment pipeline with clock cycle of 10ns. Determine the speedup ratio of the pipeline for 100ns task. What is the maximum speedup that can be achieved ?  
 (c) Write a program in assembly language to Input and Output one character in reference of Input-Output Programming. (6+6+6)
5. (a) Explain these mode of transfer in brief :  
 (i) Programmed I/O  
 (ii) Interrupt-initiated I/O  
 (b) What is Direct Memory Access (DMA) ? Explain block diagram of DMA controller and its working principles.  
 (c) What is Input-Output Processor (IOP) ? Explain sequence of operations carried out between CPU-IOP communications. (6+6+6)
6. (a) A computer system uses a memory unit with 256k words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has four parts: An indirect bit, an operation code, a register code part to specify one of 64 registers and an address part.  
 (i) How many bits are there in operation code, the register code part and address part ?  
 (ii) Draw the instruction word format and indicate the number of bits in each part.  
 (iii) How many bits are there in the data and address inputs of the memory ?  
 (b) Explain the following terms with reference of cache memory :  
 (i) Direct mapping  
 (ii) Associative mapping  
 (iii) Set-associative mapping  
 (c) Explain the concept of Virtual Memory. (7+6+5)
7. (a) (i) Solve  $(-9)_{10} * (-13)_{10}$  using Booth's Multiplication algorithm.  
 (ii) Solve division using Division Algorithm taking Divisor B=10001 & Dividend A=0111000000  
 (b) Explain the following architectures and give example of each.  
 (i) SISD  
 (ii) SIMD  
 (iii) MISD  
 (iv) MIMD (12+6)

- o O o -