Code: C-07/T-07 **Subject: COMPUTER ARCHITECTURE**

December 2005

Time: 3 Hours

Max. Marks: 100

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or best alternative in the following: (2x10)

a. In a virtual memory system, the addresses used by the programmer belongs to

(A) memory space. **(B)** physical addresses.
(C) address space. **(D)** main memory address.

b. The method for updating the main memory as soon as a word is removed from the cache is called

(A) Write-through **(B)** write-back
(C) protected write **(D)** cache-write

c. A control character is sent at the beginning as well as at the end of each block in the synchronous transmission, in order to

(A) Synchronise the clock of transmitter and receiver.
(B) Supply information needed to separate the incoming bits in to individual character.
(C) Detect the error in transmission and received system.
(D) Both **(A)** and **(C)**.

d. In a non-vectored interrupt, the address of interrupt service routine is

(A) Obtained from interrupt address table.
(B) Supplied by the interrupting I/O device.
(C) Obtained through Vector address generator device.
(D) Assigned to a fixed memory location.

e. Divide overflow is generated when

(A) Sign of the dividend is different from that of divisor.

(B) Sign of the dividend is same as that of divisor.
(C) The first part of the dividend is smaller than the divisor.
(D) The first part of the dividend is greater than the divisor.

f. Which method is used for resolving data dependency conflict by the compiler itself?

(A) delayed load. **(B)** operand forwarding.
(C) pre fetch target instruction. **(D)** loop buffer.

g. Stack overflow causes

(A) Hardware interrupt.
(B) External interrupt.
(C) Internal interrupt.
(D) Software interrupt.

h. Arithmetic shift left operation

(A) Produces the same result as obtained with logical shift left operation.
(B) Causes the sign bit to remain always unchanged.
(C) Needs additional hardware to preserve the sign bit.
(D) Is not applicable for signed 2's complement representation.

i. Zero address instruction format is used for

(A) RISC architecture. **(B)** CISC architecture.
(C) Von-Neuman architecture. **(D)** Stack-organised architecture.

j. Address symbol table is generated by the

(A) memory management software.
(B) assembler.
(C) match logic of associative memory.
(D) generated by operating system.

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Use K-maps to find the simplest Sum of Products (SOP) form of the function $F = f \cdot g$, where

$f = wx\bar{y} + \bar{y}z + \bar{w}\bar{y}\bar{z} + \bar{x}\bar{y}\bar{z}$

$g = (w + x + \bar{y} + \bar{z})(\bar{x} + \bar{y} + z)(\bar{w} + y + \bar{z})$. **(7)**

b. Design a combinational circuit that generates 9's complement of a BCD digit. **(6)**

c. Show that the dual of EX-OR is also its complement. **(3)**

Q.3 a. Explain with the help of an example, the use of hamming code as error detection and correction code. **(7)**

b. With the help of a neat sketch, explain the working of a 4-bit universal shift register. **(6)**

c. State the condition in which overflow occurs in case of addition & subtraction of two signed 2's complement number. How is it detected? **(3)**

Q.4 a. What do you understand by the term microoperation? Explain Register and Arithmetic types of microoperation. Show the hardware realisation of decrement microoperation i. e. $\alpha: A \leftarrow A - 1$. **(2+2+3)**

b. Implement the following RTL code, using common bus and tri-state buffers.

j : M$\leftarrow$A
o : A$\leftarrow$Y
h : R$\leftarrow$M
n : Y$\leftarrow$R, M$\leftarrow$ R

Assume M, A, R and Y are to be one bit D-flipflop. **(6)**

c. A register 'A' holds an 8-bit binary number 11011001. Determine the operand 'B' and the logic micro operation to be performed in order to change the value of 'A' to (i) 01101101 (ii) 11111101. **(3)**

Q.5 a. What do you mean by program control instructions? With a neat diagram, explain how the status register containing overflow, zero, sign and carry flags works with the status of the accumulator content obtained from ALU. **(3+4)**

b. What are interrupts? Explain different types of interrupts. **(6)**

c. How stack is implemented in a general microprocessor system. **(3)**

Q.6 a. What are the advantages of assembly language? How is it different from high-level language? **(6)**

b. How interrupt facility is used for input-output programming? **(3)**

c. What are the steps/operations that are performed by the processor when an interrupt is recognised. What care the programmer should take in order to enable the interrupt facility in a multiprogram environment. **(4+3)**

Q.7 a. What is vertical micro code? State the design strategy of a vertical micro coded control unit. **(6)**

b. What is a microprogram sequencer? With block diagram, explain the working of microprogram sequencer. **(2+8)**

Q.8 a. Give the flow chart for add and subtract operation of two signed 2's complement data. Explain the logic of each operation. **(4+6)**

b. Explain different methods used for establishing the priority of simultaneous interrupts. **(6)**

Q.9 a. Give the hardware organisation of associative memory. Why associative memory is faster than other memories. Deduce the logic equation used to find the match in the assosciative memory. Explain how four-bit argument register is realised. **(3+2+5)**

b. Why page-table is required in a virtual memory system. Explain different ways of organising a page table. **(4+2)**