# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

**Paper Code : PCC-CS302 Computer Organisation**

**UPID : 003444**

*Time Allotted : 3 Hours* *Full Marks :70*

*The Figures in the margin indicate full marks.*
*Candidate are required to give their answers in their own words as far as practicable*

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]

   (I) What is a program counter?

   (II) Floating point representation is used to store what type of values?

   (III) Is Excess 3-code a weighted code?

   (IV) $(2FAOC)_{16}$ is equivalent to __( )$_2$__.

   (V) Self-contained sequence of instructions that performs a given computational task is called _____.

   (VI) What are the parameters which influence the characteristics of a microprocessor?

   (VII) The addressing mode used in an instruction of the form ADD X Y, is _____ mode.

   (VIII) Simplify the following expression using Boolean algebra.
   AB + AB'

   (IX) The following transfer statement specifies a memory. Explain the memory operation.
   M[AR] ← R3

   (X) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers. How many selection inputs are there in each multiplexer?

   (XI) How many flip-flops will be complemented in a 10-bit binary counter to reach the next count after 1001100111?

   (XII) Logic X-OR operation of $(4ACO)_H$ & $(B53F)_H$ results_____ in heaxdecimal.

## *Group-B (Short Answer Type Question)*

*Answer any three of the following* [ 5 x 3 = 15 ]

2. Explain FLYNN Classification with suitable examples. [ 5 ]
3. Explain floating point representation technique for IEEE 754 standard. [ 5 ]
4. Describe sign extension technique for singed number representation. [ 5 ]
5. A machine has a 32-bit architecture, with 1-word long instructions. It has 64 registers, each of which is 32 bits long. It needs to support 45 instructions, which have an immediate operand in addition to two register operands. Assuming that the immediate operand is an unsigned integer, What is the maximum value of the immediate operand ? [ 5 ]
6. State the differences between Hardwired and Micro-programmed Control Unit. [ 5 ]

## *Group-C (Long Answer Type Question)*

*Answer any three of the following* [ 15 x 3 = 45 ]

7. (a) Explain 4 bit Ripple Carry adder using Full Adder with a suitable block diagram. [ 5 ]
   (b) What is the binary value 0.011010 in decimal ? [ 5 ]
   (c) What is 0.687510 in binary ? [ 5 ]
8. (a) Consider a 4-way set associative cache consisting of 128 lines with a line size of 64 words. The CPU generates a 20-bit address of a word in main memory. Find the number of bits in the TAG, LINE and WORD fields respectively. [ 7 ]
   (b) Explain Virtual memory with suitable example. [ 8 ]
9. Explain 0 - address , 1 - address , 2 - address & 3 - address instruction format with suitable examples. [ 15 ]
10. (a) Explain fixed point number system for signed numbers. [ 9 ]
    (b) Represent the signed number representation for 4 bit numbers of sign magnitude , 1's complement and 2's complement [ 6 ]

11. (a) An 8KB direct-mapped write-back cache is organized as multiple blocks, each of size 32-bytes. The processor generates 32-bit addresses. The cache controller maintains the tag information for each cache block comprising of the following: 1 Valid bit 1 Modified bit. As many bits as the minimum needed to identify the memory block mapped in the cache. What is the total size of memory needed at the cache controller to store meta-data (tags) for the cache? [ 7 ]

(b) A computer has a 256 KByte, 4-way set associative, write back data cache with block size of 32 Bytes. The processor sends 32 bit addresses to the cache controller. Each cache tag directory entry contains, in addition to address tag, 2 valid bits, 1 modified bit and 1 replacement bit. What is the number of bits in the tag field of an address ? [ 8 ]