53 (CS 301) COAR

2019

COMPUTER ORGANIZATION AND ARCHITECTURE

Paper : CS 301 (Back)

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* We have two designs D1 and D2 for a synchronous pipeline processor. D1 has 5 pipeline stages with execution times of 3 *nsec*, 2 *nsec*, 4 *nsec*, 2 *nsec* and 3 *nsec* while the design D2 has 8 pipeline stages each with 2 *nsec* execution time. How much time can be saved using design D2 over design D1 for executing 100 instructions ? 10

(b) (i) How many 128×8 RAM chips are needed to provide a memory capacity of 2048 bytes?

(ii) How many lines of address bus must be used to access 2048 bytes of memory? How many of these lines will be common to all chips?

(iii) How many lines must be decoded for the chip select? Specify the size of the decoder. 10

2. (a) What is arithmetic overflow? When does it occur and how it can be detected? 5

(b) What is decimal equivalent of the 32-bit IEEE floating point value CC4C0000? 5

(c) A processor has 40 distinct instructions and 24 general purpose registers. A 32-bit instruction word has an opcode, two registers operands and an immediate operand. What is the number of bits available for the immediate operand field? 10

3. Write a program to evaluate the following statement —

$$X = \frac{A - B + C * (D * E - F)}{G + H * K}$$

(i) using three address instructions format

(ii) using two address instructions format

(iii) using one address instructions format

(iv) using zero address instructions format. 20

4. (a) Convert 1234.125 into 32-bit IEEE floating point format. 10

(b) Write a short note on Memory Hierarchy. 10

5. (a) What is the difference between Computer Architecture and Computer Organization? Explain with examples. 10

(b) Use the Booth's algorithm to perform 23*29, where each number is represented using 6-bits. 10

Contd.

6. Consider a 4-stage pipeline processor. The number of cycles needed by the four instructions I1, I2, I3, I4 in stages S1, S2, S3, S4 is shown below :

	S1	S2	S3	S4
I1	2	1	1	1
I2	1	3	2	2
I3	1	1	1	3
I4	1	2	2	2

What is the number of cycles needed to execute the following loop ?

```
for (i = 1 to 2)
{
    I1;
    I2;
    I3;
    I4;
}
```


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