Department of Computer Science Engineering

CONTINUOUS ASSESSMENT TEST-I

Subject : COMPUTER ARCHITECTURE	**Subject Code** :CS8491
Year/Sem : II/IV	**Branch** : CSE&IT
Date/Session : 23.03.2021 /FN	**Time** : 1 ½ Hrs
	Marks : 50

Answer ALL Questions

Part – A (5x2=10 Marks)

1. How to represent instruction in a computer system?(K)(CO1)

2. Write bit pair recoding for the following multiplier 0001110001111011.(A) (CO2)

3. How CPU execution time for a program is calculated?(U)(CO2)

4. Convert 16 bit binary versions of 2_{10} and -2_{10} to 32 bit binary numbers.(E)(CO3)

5. Write the MIPS code for the following instruction if f,g,h, i, j are assigned to registers $S0, $S1, $S2, $S3, $S4.(E) (CO1)

    F=(g+h)-(i+j)

Part – B (2x13=26 Marks)

6. (a) (i) Discuss about the various components of a computer system.(K)(CO1)(07)

    (ii)Translate the following C code to MIPS assembly code. Use a minimum number of instructions.

    Assume that i and k correspond to registers $s3 and $s5 and the base of the array save is in $s6.

    What is the MIPS assembly code corresponding to this C segment?

        while (Sava[i]==k)
        i+=1;   (A)(CO1)(06)
                        Or

(b) (i) $S1 & $S2 of a Computer contain the decimal values 1200 & 4600. Calculate the address of the memory operand for the following instructions. (A)(CO1)(07)

  i.   LW $S2,20($S1)
  ii. SW 30($S1,$S2),$S5
  iii. Add $t0, -($S2),$S1

(ii) Explain the representation of instruction in detail.(K)(CO1) (06)

7.(a) (i). Perform X + Y and Y – X using 2's Complements for the two given binary numbers
       X=0000 1011 1110 1111 and Y= 1111 0010 1001 1101.   (A)(CO3)(04)

   (ii). Discuss in detail about restoring and non restoring division algorithm in detail with diagram and
       demonstrate the division of 10101_2 by 00101_2 (E) (CO3) (09)

                                          Or

(b)

Multiply each of the following pairs of signed 2's-complement numbers using the Booth algorithm. In each case, assume that A is the multiplicand and B is the multiplier.

$$(a)\ A = 010111 \quad \text{and} \quad B = 110110$$
$$(b)\ A = 110011 \quad \text{and} \quad B = 101100$$
$$(c)\ A = 110101 \quad \text{and} \quad B = 011011$$
$$(d)\ A = 001111 \quad \text{and} \quad B = 001111$$

                                                          (A)(CO3)(13)

Part – C (1x14=14 Marks)

8. (a)Consider three different processors P1, P2, P3 executing the same instruction set. P1 has a 3 GHz clock rate and a CPI of 1.5. P2 has a 2.5 GHz clock rate and CPI of 1.0. P3 has a 4.0 GHz clock rate and has a CPI of 2.2. (A)(CO2)

        a) Which processor has the highest performance expressed in instructions/second? (4)

        b) If the processors each execute a program in 10 seconds, find the number of cycles & the
           number of instructions. (3)

        c) We are trying to reduce the execution time by 30% but this leads to an increase of 20% in the
CPI. What clock rate should we have to get this time reduction? (7)

                                          Or

(b)(i) Computer A runs a program in 12 seconds with a 3GHz clock. We have to design a computer B
       such that it can run the same program within 9 seconds. Determine the clock rate for computer B.
       Assume that due to increase in clock rate, CPU design of computer B is affected and it requires
       1.2 times as many clock cycles as computer A for execution this program.(7) (CO2)(A)

(ii) Table (a) shows two code sequences with number of instructions of different instruction classes with in each code sequence, respectively. The instructions are classified as A, B and C according to the CPI as shown in Table (b). From the given information.(7)(CO2)(A)

      (i)   Determine which code sequence executes the most instructions.

      (ii)   Find which code sequence will execute quickly.

      (iii)   Determine the CPI for each code sequence.

ode Sequence	struction counts for each instruction class		
	A	B	C
1	4	2	4
2	8	2	2

Table (a)

CPI for each instruction class		
A	B	C
1	2	3

Table (b)

Course Outcomes:

CO1: Understand the physical and logical aspects of Computer System

CO2: Analyze the various parameters of the processor to improve system performance.

CO3: Evaluate the fixed and floating point arithmetic operations.

CO4: Design data path and control unit of computer system.

CO5: Understand parallel processing architectures with pipelining and avoidance of hazards

CO6: Define the various components of computer system hardware.