CSCI 360   **Assignment 4: ABENDs and Dump Reading**
                                50 points

To complete this assignment, you may print and write on this document. If so, print clearly and carefully and scan the document to submit it. You may also simply type your answers in this document in red type and submit the document.

Run the following program in an `ASSIGNS` PDSE named `ASSIGN4`:

```
DUMPPGM  CSECT
         USING DUMPPGM,15    ESTABLISH A BASE REGISTER
         L     1,ONE         LOAD THE FIRST NUMBER INTO R1
         L     2,TWO         LOAD THE SECOND INTO R2
         AR    1,2           ADD THE TWO NUMBERS
         ST    1,THREE       STORE THE RESULT
         XDUMP THREE,4       DUMP THE RESULT
         BCR   B'1111',14    RETURN TO CALLER
*
*     NO LTORG NECESSARY
*
ONE      DC    F'64'         FIRST NUMBER
TWO      DC    F'32'         SECOND NUMBER
EOFFLAG  DC    C'0'          A FLAG SAVE AREA
THREE    DS    CL4' '        SUM OF THE TWO NUMBERS
*
         END   DUMPPGM
```

After running the above program, answer the following questions about the `ABEND` that occurred (4 points each unless otherwise indicated):

Remark: Dumped psw is FFC50006 A000000E, implies
- Interupt code: 6
- ILC/CC \to binary: A_16 = 1010
- ILC: 10
- CC: 10
- Next instruction address: 00000E

1. What is the address of the next instruction to be executed?

    Next instruction address is 00000E, given by the last three bytes of the dumped PSW.

2. What is the address of the instruction that caused the abend?

    ILC is 10, which means the instruction that caused the ABEND is 2(2) = 4 bytes long. Since the next instruction is at address 00000E, the ABENDing instruction is at address E – 4 = A = 00000A

3. What type of error occurred?

    Interupt code is: 6. Thus, it was a specification exception (S0C 6).

4. What actually causes this error?

    A common cause for a S0C 6 is when an instruction requires one of the operands to be on a fullword boundary, but the provided operand is not. In the given example, we try to store R1s contents into the defined constant THREE, but three is a character length 4 constant. There is no gaurantee that CL constants are placed on a fullword boundary.

5. What is the contents of register 1 in decimal?

    R1 has hex contents 00000060. $00000060_{16} = 6(16)_{10} = 96_{10}$

6. What does the value in reg 1 represent at the time of `ABEND`?

    The result of AR 1,2. Since register 1 was loaded with ONE = 64_{10}, and register 2 was loaded with TWO = 32_{10}, the contents of 1 are R1 = R1 + R2 = 64 + 32 = 96

7. Why is the `LOC` address of the storage area with the label `ONE` on it `000018` when the branch statement before it whose `LOC` address is `000014` only takes up 2 bytes?

    Because ONE is defined to be a fullword, the F in the DC statement enforces that ONE be placed on a fullword boundary. If ONE were placed at the next available address… $14_{16} + 2 = 16$, it would not be on a fullword boundary. Fullword boundarys are addresses that have rightmost hexdigit 0,4,8,or C, which implies that the next available fullword boundary is 18. Thus, there are two slack bytes between the BCR instruction and ONE.

8. What are the contents of the two bytes of user storage starting at address `000016`? What do they represent?

    Contents are F5: By problem 7, these two bytes are slack bytes between the BCR and the address of ONE. Two bytes that are used as padding so ONE could be placed on a fullword boundary.

9. What are the contents of the byte saved at address `00001B`? Does this byte represent the first byte of a full word?

    Contents: 40_{16}, The address at 1B is the address of the last byte that encompases the four bytes that ONE takes up in storage. This address is not the first byte of a fullword because the rightmost digit is not 0,4,8, or C.

10. If the dump program error were corrected, what value would the storage area at label `THREE` contain?
    The contents of R1.

11. What two instructions have you worked with which cause data conversion to take place?
    XDECI and XDECO

12. What is the decimal equivalent of hex `0002BA14`?

$0002BA14_{(16)} = 4(16^0) + 1(16^1) + 10(16^2) + 11(16^3) + 2(16^4) = 178708_{(10)}$

13. Circle the letter for the following lengths that are synonyms for the same length? (2 points)

   a. 6 hex digits
   b. 4 bytes
   c. 8 hex digits
   d. 32 bytes
   e. 32 bits
   f. doubleword
   g. fullword
   h. byte
   i. foot
   j. 128 bits
   k. halfword
   l. meter