Faculty of Computers & Information Technology **Course Name: Computer Organization II** **Course code: CAS 303** **Instructor: Dr. El-Sayed El-Dahshan** ***SOLUTIONS***	EELU الجامعة المصرية للتعلم الإلكتروني Egyptian E-Learning University	**Year: 2016-2017** **Fall semester** **MT Exam, Nov. *2016*** **Time allowed: 1.5 hrs** **Marks: 20**

Answer the following question *SOLUTION* *(all Qs have equal weights=4).*

1- I- A computer system uses a simplified 14-bit floating point with excess-16 bias to represent binary numbers.

a) How does this system represent the number 15.75_{10} in binary?

b) What is the decimal equivalent of the binary number: 01010010111000?

Answer:

a- $15.75_{10} = (1111.11)_2 = (0.111111 \times 2^4)_2$

Sign bit = 0; Exponent: $4+16 = 20_{10} = 10100_2$; Mantissa: 11111100;

So the binary number is 0 10100 11111100.

b- We have 10100 for the exponent, which is 20 in decimal, so the real exponent is 20-16 = 4.
Since the sign bit is 0, we have a positive number.

So the number is $+0.10111000 \times 2^4 = 1011.1_2 = 11.5_1$

II- Show the bit configuration of a 24-bit register when the content represents the decimal equivalent of (432)10: (a) a binary; (b) in BCD; (c) excess-3; (d) in ASCII using eight bits with even parity. *8-bit ASCII for 2= 00110001, 3=00110011 and for 4=00110100.*

Answer:

(a)432 = 0000 0000 0000 0001 1011 0000 binary

(b) 432 = 0000 0000 0000 0100 0011 0010 BCD

(c) 432 in excess-3 = the binary code of 435 = 0000 0000 0000 0001 1011 0011

(d)432 = 10110100 00110011 10110001

2- I- The 8-bit register AR, BR, CR and DR initiatory have the following values.
AR = 11110010, BR = 11111111, CR = 10111001, DR = 11101010.
-Determine the 8-bit values in each register off the execution of the following sequence of micro operations.

AR ←AR + BR
CR ←CR ^ DR, BR←BR + 1
AR ←AR – CR

Micro operation	AR	BR	CR	DR
Initially	1111 0010	1111 1111	1011 1001	1110 1010
AR ← AR + BR	1111 0001	1111 1111	1011 1001	1110 1010
CR← CR AND DR, BR←BR+1	1111 0001	0000 0000	1010 1000	1110 1010
AR←AR – CR	0100 1001	0000 0000	1010 1000	1110 1010

Answer:

```
AR + BR =    11110010
          + 11111111
         (1)11110001
AR = 11110001

CR ^ DR =   10111001
          ^ 11101010
            10101000
CR = 10101000
BR + 1 = 00000000
BR = 00000000
AR - CR  =  11110001 - 10101000
         =  11110001 + ~(10101000) + 1
         =  11110001 + 01010111 + 1
         =  11110001
          + 01010111
          + 00000001
            01001001
AR = 01001001
```

II- An 8-bit register contains the binary value 10011100. What is the register value after an arithmatic shift rigt? Starting from the initial number 10011100, determine the register value after an arithmatic shift left, and state whether there ia an overflow.

Microoperation	R=10011100	Overflow (Yes or No)
R← ashr R	11001110	No
R← ashl R	00111000	Yes/ overflow because a negative number changed

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3-

I- A computer uses a memory unit with 512 words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has four parts: an indirect bit, an operation code, a register code part to specify one of 16 registers, and an address part.

How many bits are there in the operation code part:	**18**
How many bits are there in the register code part:	**4**
How many bits are there in the address part:	**9**
How many bits are there in the data inputs of the memory:	**32**
How many bits are the in the address inputs of the memory:	**9**

Answer:

II- What is the 8-bit results after performing each of the following shift operations.

- Arithmetic Shift Left of (11110010) =
- Circular shift left of (11110010) =
- Logical shift left of (11110010) =
- Arithmetic shift right of (11110010) =

Answer:

Arithmetic Shift Left of **(11110010) = 11100100**

Circular shift left of **(11110010) = 11100101**

Logical shift left of **(11110010) = 11100100**

Arithmetic shift right of **(11110010) = 11111001**

4-

I- A digital computer has a common bus system for 32 registers of 64 bits each. The bus is constructed with multiplexers.

How many multiplexers are there in the bus	**64**
How many selection inputs are there in each multiplexer	**5**
What the size of decoder needed to select the destination	**5- to- 32**

How many multiplexers are there in the bus 64 How many selection inputs are there in each multiplexer 5 How many 3-state buffers are needed to reconstruct the bus using decoders and 3-state buffers 32*64=2048 What the size of decoder needed to select the destination 5-to-32

Answer:

II- Suppose we have the instruction Load 1000. Given memory and register R1 contain the values below:

Memory

1000	1400
...	
1100	400
...	
1200	1000
...	
1300	1100
...	
1400	1300

R1: 200

Determine the actual value loaded into the accumulator and fill in the table below:

Mode	Value Loaded into AC
Immediate	**1000**
Direct	**1400**
Indirect	**1300**

- **Answer:**

5- **MCQ questions**

1. **The content of a 4-bit register is initially 1101. The register is shifted 2 times to the right with the serial input being 1011101. What is the content of the register after each shift?**
   a. **1110, 0111**
   b. 0001, 1000
   c. 1101, 1011
   d. 1001, 1001
2. **In which addressing the simplest addressing mode where an operand is fetched from memory is_____:**
   a. Immediate addressing
   b. **Direct addressing**
   c. Register addressing
   d. None of these
3. **Which is data manipulation types are:**
   a. Arithmetic instruction
   b. Shift instruction
   c. Logical and bit manipulation instructions
   d. **All of these**
4. **If a register containing data (11001100)2 is subjected to arithmetic shift left operation, then the content of the register after 'ashl' shall be**
   a. $11001100)_2$.
   b. $(1101100)_2$.
   c. $(10011001)_2$.
   d. **$(10011000)_2$**
5. **A Micro operation is an elementary operation performed with the data stored in _____**
   a. **Registers**
   b. Flip Flop
   c. Demultiplexers
   d. Memory
6. **Floating point representation is used to store**
   a. Boolean values
   b. whole numbers
   c. **real integer**
   d. integers
7. **The operation executed on data stored in registers is called**
   a. Macro-operation
   b. **Micro-operation**
   c. Bit-operation
   d. Byte-operation
8. **A group of bits that tell the computer to perform a specific operation is known as**
   a. **Instruction code**
   b. Micro-operation
   c. Accumulator
   d. Register
9. **In which addressing mode the operand is given explicitly in the instruction**
   a. Absolute
   b. **Immediate**
   c. Indirect
   d. Direct.
10. **_____ register keeps tracks of the instructions stored in program stored in memory.**
    a. AR (Address Register)

b. XR (Index Register)
c. **PC (Program Counter)**
d. AC (Accumulator)

11. _____is concerned with the structure and behavior of the Computers as seen by the user

a) Computer Implementation
b) **Computer Architecture**
c) Computer Organization
d) None of the above

12. One way of constructing a common Bus System is with

a. Multiplexers
b. Demultiplexers
c. Encoder
d. None of the above

13. A flip-flop is a binary cell capable of storing information of

a. One bit
b. Byte
c. Zero bit
d. Eight bit

14. Arithmetic Micro-operations includes

a. Binary Adder
b. Binary Adder Sub tractor
c. Binary Incrementer, Arithmetic Circuit
d. All of the above

15. $(-27)_{10}$ can be represented in a signed magnitude format and in a 1's complement format as

a. 111011 & 100100
b. 100100 & 111011
c. 011011 & 100100
d. 100100 & 011011

16. A computer system with 6 registers 32-bit each, and a 2048×16 memory unit. These components are connected to a common bus constructed using multiplexers. What is the number and the size of these multiplexers?

a. 16 8x1
b. 32 4x1
c. 32 8x1
e. 32 16x1

GOOD LUCK