

# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

**TRIMESTER 1, 2021/2022**

**DSN5101 – COMPUTER ARCHITECTURE**  
(All sections / Groups)

25<sup>rd</sup> NOVEMBER 2021  
11.00a.m – 4.00p.m  
(5 Hours)

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**INSTRUCTIONS TO STUDENT:**

1. This question paper consists of **FIVE** pages.
2. Answer **ALL** questions.
3. Please paste your answers in the answer sheet provided.
4. Question that involve with drawing please paste the answer in the answer sheet provided and convert your answer into PDF form.
5. Any **CHEATING** cases will be effect your marks.

**SECTION A: MULTIPLE CHOICE QUESTIONS (MCQ) (10 Marks)**

***Instruction: Answer ALL the questions in this section***

1. Which of the following are TRUE about I/O commands?
  - i. Control – used to activate a peripheral and tell it what to do. For example, a magnetic tape may be instructed to rewind or move forward.
  - ii. Test – used to test various status conditions associated with an I/O module and its peripherals. For example, testing a device to see if it is powered and available for use.
  - iii. Read – causes the I/O module to take an item of data from the data bus and subsequently transmit that data item to the peripheral.
  - iv. Write – causes the I/O module to obtain an item of data from the peripheral and place it in an internal buffer.
  - A. I and II
  - B. II and III
  - C. III and IV
  - D. All of the above
2. Which of the following the formula to calculate bus bandwidth?
  - A. Bandwidth = bus length x bus width
  - B. Bandwidth = bus width x bus speed
  - C. Bandwidth = bus speed x bus size
  - D. Bandwidth = bus size x bus width
3. \_\_\_\_\_ is one of the technique in device identification that have multiple interrupt attached in I/O modules. Most of it is straightforward approach to the problem.
  - A. Software poll
  - B. Daisy chain
  - C. Multiple interrupt lines
  - D. Bus arbitration
4. Which of the following is the common fields or flags of the program status word (PSW).
  - A. Sign, Zero, Carry, Overflow, Interrupt
  - B. Sign, Zero, Carry, Equal, Overflow, Interrupt
  - C. Sign, Zero, Equal, Overflow, Interrupt, Supervisor
  - D. Sign, Zero, Carry, Equal, Overflow, Interrupt, Supervisor

5. Perform the following binary arithmetic operations.

i)  $1101 + 1011$

ii)  $1010 - 0111$

- A. 11000; 0011  
 B. 10111; 1100  
 C. 11000; 0111  
 D. 10101; 0011

6. Given decimal number above, convert the number to binary using sign magnitude representation.

i)  $X = -49$

ii)  $Y = -78$

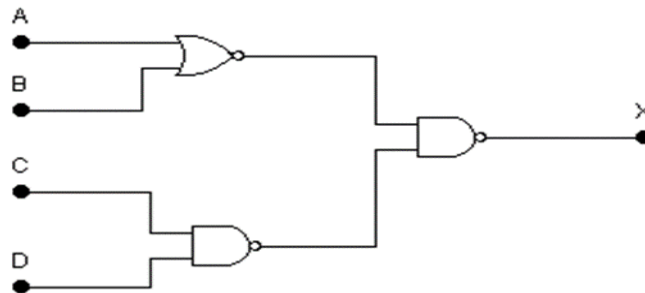
- A.  $X = 00110001$ ;  $Y = 01001110$   
 B.  $X = 01110001$ ;  $Y = 01011110$   
 C.  $X = 10110001$ ;  $Y = 11001110$   
 D.  $X = 10110011$ ;  $Y = 11101110$

7. Based on the given Boolean expression below, find the simplified expression using Boolean algebra.

$$X = (A' + C') + (A'B') + (B'C')$$

- A.  $A' + C'$   
 B.  $A' + B' + C'$   
 C.  $A'B' + C'$   
 D.  $A + C$

8. Find the Boolean expression X from the circuit diagram below and simplify the Boolean expression by using Boolean algebra techniques.



- A.  $X = A+B'. CD''$ ;  $X = A + B + CD$   
 B.  $X = A'+B'. C'D''$ ;  $X = A + B + CD$

- C.  $X = A' + B' \cdot C'D'$ ;  $X = A + B + CD$   
D.  $X = A' + B \cdot C'D''$ ;  $X = A + B + CD$
9. Which of the is TRUE about factors of allocation bit?
- A. Number of memory size
  - B. Number of addressing mode
  - C. Processor speed
  - D. Bus structure
10. What is -123 in two's complement with 8-bit representation?
- A.  $0001\ 0000_2$
  - B.  $1101\ 0011_2$
  - C.  $1000\ 0101_2$
  - D.  $1000\ 1100_2$

**SECTION B: STRUCTURED QUESTIONS (30 Marks)**

**Instruction:** Answer *ALL* the questions in this section and write your answers in the answer booklet provided.

**QUESTION 1 (10 Marks)**

- a) Design a combinational circuit with three inputs, X, Y and Z and three output M, N, and O. Given decimal equivalent binary input which is 0, 1, 2 or 3 and the binary output is one value more than the input (increase by one). Another binary input 4, 5, 6 and 7, the binary output is one value less than the input (decrease by one). Please find the following questions below:
- Construct the truth table (2 Marks)
  - Based on the truth table, find the Boolean expression for M, N and O in SOP form. (1.5 Marks)
  - Simplified the Boolean expressions for M, N, and O by using K-Map method. (1.5 Marks)
- b) Given three input A, B and C and one output Z. Design the combinational circuit based on the given input and output. When the decimal equivalent of binary input is odd number, the binary output is 1 else 0. Perform the following questions.
- Construct the truth table. (2 Marks)
  - Based on the truth table, find the Boolean expression Z in SOP form. (1 Marks)
  - Simplified Boolean expressions of Z by applying Boolean algebra rules and De Morgan's theorem. (2 Marks)

**QUESTION 2 (10 Marks)**

- a) Given the following expression,

$$Y = [ ((K / L) * P + N) * (A - (B + S)) ]$$

- Convert the expression Y to postfix notation. (1 Marks)
  - Write the expression X into the following machine instructions:
    - Two-address format (1 Marks)
    - Three-address format (1 Marks)
- b) Refer to the question below:
- What is the Gray code (4 bits) for decimal value  $7_{10}$ ? (2 Marks)
  - What is the advantage of Gray code over straight binary sequence? (1 Marks)

- c) For Boolean function,  $M = (AB') + (BC') + (A'B C')$
- i. Construct the appropriate truth table, and (2 Marks)
  - ii. Find the standard SOP and standard POS expressions (2 Marks)

**QUESTION 3 (10 Marks)**

- a) Given input combinations 010, 100, 001, 011, a HIGH output will be presented in decoding. For other input combinations, the output is LOW. Construct the circuit for the above with a suitable decoder and necessary logic gates.
- i) Construct the truth table (2 marks)
  - ii) Find Boolean expression for the output function (1 marks)
  - iii) Draw the logic diagram of the implemented decoder. (2 marks)

- b) Based on the Boolean expression below, draw logic diagram and simplify the following expression using Boolean algebra techniques

$$X = A B' + A B' C + A B' CD + A B' CDE \quad (3 \text{ Marks})$$

- c) Using 8-bit two's complement, calculate  $56_{10} - 108_{10}$ . Show the steps and verify the result. (2 Marks)