



UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION MAY 2024 SEMESTER

COURSE : TFB1053 - COMPUTER SYSTEMS
DATE : 1 AUGUST 2024 (THURSDAY)
TIME : 9:00 AM - 12:00 NOON (3 HOURS)

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

Note :

- i. There are **SIX (6)** pages in this Question Booklet including the cover page
- ii. **DOUBLE-SIDED** Question Booklet.

1. a. Illustrate the elements involved in an Input-Process-Output (IPO) model. [2 marks]
- b. Describe the role of Storage component in an IPO model of a computer system. [4 marks]
- c. Consider the digital circuit diagram shown in **FIGURE Q1** where A, B, C are the inputs and Q is the output.

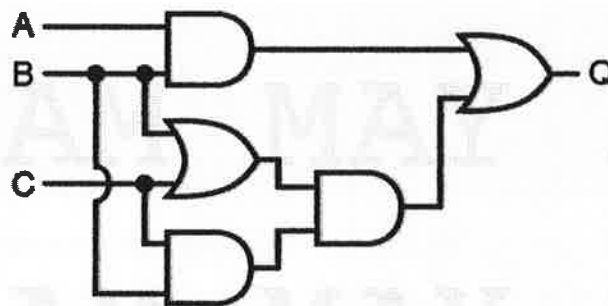


FIGURE Q1

- i. Write the Boolean expression of Q. [3 marks]
 - ii. Construct a complete Truth Table for the output, Q. [7 marks]
- d. State and verify the **TWO (2)** DeMorgan's theorems by means of Truth Tables. [4 marks]

2. a. i. Explain **ONE (1)** benefit of 1's complement number compared with sign-and-magnitude representation.

[2 marks]

- ii. Explain **ONE (1)** benefit of 2's complement number compared with 1's complement number representation.

[2 marks]

- b. Complete the addition of the two signed decimal numbers, -23 and -104 by using a 10-bit 1's complement representation.

[8 marks]

- c. A computer system operated using decimal digits. The system stored a floating-point number in a format of SEEMMMMM in excess-60. The sign is 1 for a positive number and 2 for a negative number. Based on the system specifications:

- i. Compute the floating-point representation for the decimal number, -0.00002234657 .

[2 marks]

- ii. Complete the addition of the two floating-point numbers 26054321 and 25811223. Check your answer using the decimal number representation.

[6 marks]

3. a. Discuss the concept of CPU registers in a modern computer with regards to the relevant components of Little Man Computer (LMC) model. [6 marks]
- b. Draw a flowchart that describes the steps in which LMC follows to fetch and execute a branch instruction. [4 marks]
- c. i. Describe the memory characteristics of the Von Neumann architecture. [4 marks]
- ii. Write an LMC program that finds a positive difference of two numbers. [6 marks]

4. a. State **THREE (3)** characteristics of typical input/output devices. [3 marks]
- b. Explain **THREE (3)** different ways by which data can be transferred from input/output devices to the memory. [9 marks]
- c. With an aid of a diagram, discuss the sequences that take place when an interrupt occurs. [8 marks]

5. a. Explain the purpose of a cache memory. [2 marks]
- b. Discuss the steps used in designing a CPU. [6 marks]
- c. i. Define the meaning of pipelining. [2 marks]
- ii. Give **ONE (1)** reason why instruction pipelining is required. [2 marks]
- iii. Explain the working procedure of instruction pipelining by illustration involving a Little Man Computer (LMC) model. [8 marks]

- END OF PAPER -