UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	COMPUTER ARCHITECTURE
COURSE CODE	:	BIC 10503
PROGRAM ME	:	1 BIS/1BIP/1 BIW/1BIM
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) What is used to measure the performance of a processor to address the limitations of MIPS (Millions of Instructions Per Second) and CPI (Cycles Per Instruction)/IPC (Instructions Per Cycle).

(2 marks)

(b) When run on a given system, a program takes 3 000000 cycles. If the system achieves a CPI of 100, how many instructions are executed to run the program? Show your calculation.

(4 marks)

(c) A computer executes a program in 150 s and another version executes the same program in 100 s. What is the speedup that the manufacturer has achieved over the two version of computer? Show your workings.

(4 marks)

(d) Consider a processor that executes a total of 1,000,000 memory references, 945,000 of which hit in the cache and 45,000 hit in the main memory. Calculate the `hit` and `miss` rates in the cache and the main memory. Show your workings.

(6 marks)

(e) The 32-bit value 0xa7256733 is stored to the location 0x1000. What is the value of the byte in address 0x1002 if the system is Big endian and Little endian? Show your solution.

(4 marks)

Q2 (a) State the difference between computer architecture and computer organization.

(2 marks)

(b) State **TWO (2)** examples of output devices.

(2 marks)

(c) Discuss about **TWO (2)** criteria's in Input/Output (I/O) devices that influence the performance of the data processing in a modern computer.

(6 marks)

(d) Draw and label a modern Pentium-based computer's interconnection structure.

(10 marks)

Q3 (a) Convert the following hexadecimal number into binary representation. Show your calculation:

(i) $CA97_{16}$

(ii) $97BAD_{16}$

(4 marks)

(b) Perform the following arithmetic operation in two's-complement notation. Show your calculation:

(i) $51_{10} - 29_{10}$

(ii) $-6_{10} - 13_{10}$

(6 marks)

(c) Given Boolean function, $D = (\overline{A}+B).\overline{C}+(C+B)$

(i) Construct a truth table for function D.

(4 marks)

(ii) Construct a Karnaugh Map from the equation and the Truth Table in **Q3(c)(i)**.

(4 marks)

(iii) Generate the simplest equation for function D from the Karnaugh Map.

(2 marks)

Q4 (a) Based on **FIGURE Q4(a)**, three-word instruction is stored at memory location 500 and the address field of the instruction is at memory address 502.

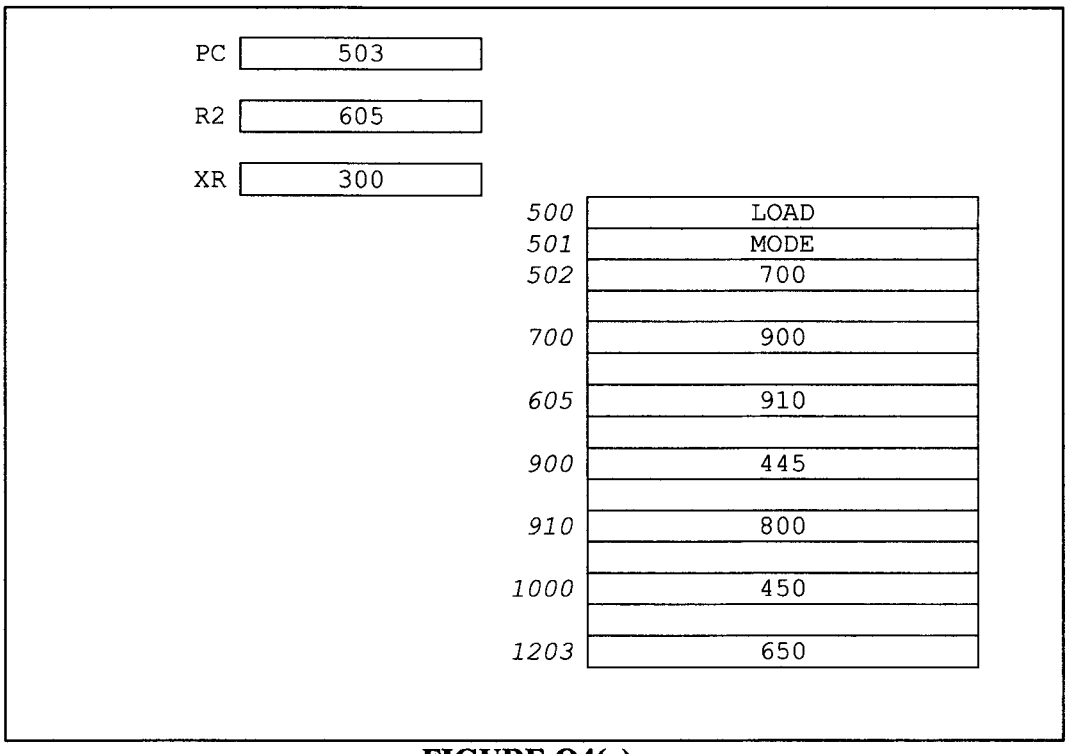

FIGURE Q4(a)

Based on the value given for memory and registers, find out the **Effective Address – EA** and **Operand** for each of the following addressing mode:

(i) Immediate Mode

(ii) Direct Mode

(iii) Register Addressing Mode

(iv) Register Indirect Mode

(v) Indexed Addressing Mode

(10 marks)

(b) Briefly discuss **FIVE (5)** steps in instruction pipeline.

(10 marks)

Q5 (a) Describe a hardwired implementation of a control unit.

(2 marks)

(b) Based on **FIGURE Q5(b)**, discuss **FOUR (4)** inputs and **TWO (2)** output for the model of control unit.

(18 marks)

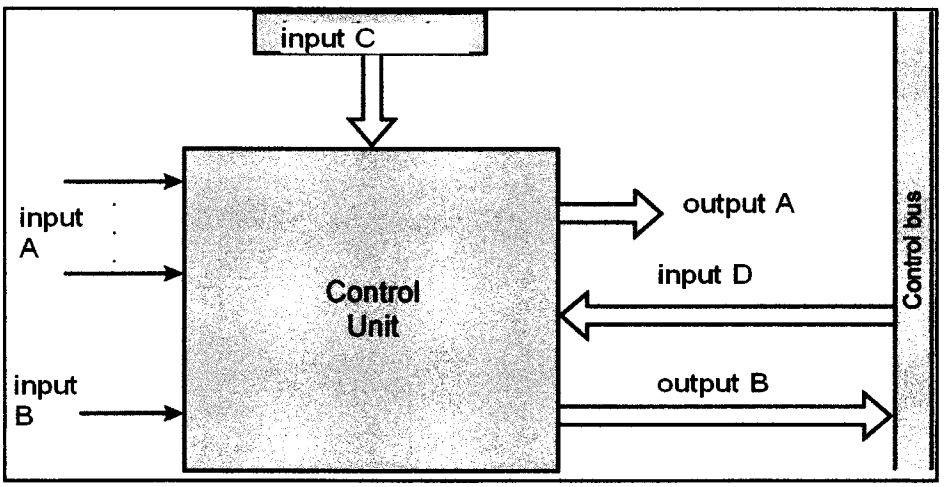

FIGURE Q5(b)

- END OF QUESTION -

Appendix A

Algebra Boolean Theorems

Name	AND form	OR form
Identity law	$1A = A$	$0 + A = A$
Null law	$0A = 0$	$1 + A = 1$
Idempotent law	$AA = A$	$A + A = A$
Inverse law	$A\overline{A} = 0$	$A + \overline{A} = 1$
Commutative law	$AB = BA$	$A + B = B + A$
Associative law	$(AB)C = A(BC)$	$(A + B) + C = A + (B + C)$
Distributive law	$A + BC = (A + B)(A + C)$	$A(B + C) = AB + AC$
Absorption law	$A(A + B) = A$	$A + AB = A$
De Morgan's law	$\overline{AB} = \overline{A} + \overline{B}$	$\overline{A + B} = \overline{A}\,\overline{B}$