UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	COMPUTER ARCHITECTURE
COURSE CODE	:	BIT 2033 / BIT 20303
PROGRAMME	:	2 BIT
EXAMINATION DATE	:	DECEMBER 2012 / JANUARY 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Instruction: Answer **ALL** questions.

Q1 (a) The performance of a processor can be measured using _____.

(2 marks)

(b) A benchmark program is run on 133 MHz processor. The executed program consists of 200 000 instruction executions, with the following instruction mix and clock cycle count as shown in Table 1:

Table 1: Instruction Execution

Instruction Type	**Instruction Count**	**Cycles per Instruction**
Integer Arithmetic	90 000	2
Data Transfer	64 000	1
Floating Point	30 000	2
Control Transfer	16 000	2

Determine the effective Cycles Per Instruction (CPI), Million Instruction Per Second (MIPS) rate and execution time for this program. Show your working.

(9 marks)

(c) For, each of the following cases;

(i) A memory system where performance was the most important goal

(ii) A memory system where cost was the most important factor.

(iii) A design where it is important for data to be stored for long periods of time without any action on the processor's part

State whether Static RAMs (SRAMs) or Dynamic RAM (DRAMs) would be more appropriate building blocks for the memory system and explain why. Assume there is only one level in the memory hierarchy.

(9 marks)

Q2 (a) Differentiate between computer architecture and computer organization.

(2 marks)

(b) State **TWO (2)** examples of Input 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 (bus) which is consisting of several types Input/Output (I/O) module?

(10 marks)

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

(i) $14FC_{16}$

(ii) $CA97_{16}$

(iii) $97BAD_{16}$

(6 marks)

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

(i) $-21_{10} - 35_{10}$

(ii) $-12_{10} + 40_{10}$

(4 marks)

(c) Given the following 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**, three-word instruction is stored at memory location `500` and the address field of the instruction is at memory address `502`.

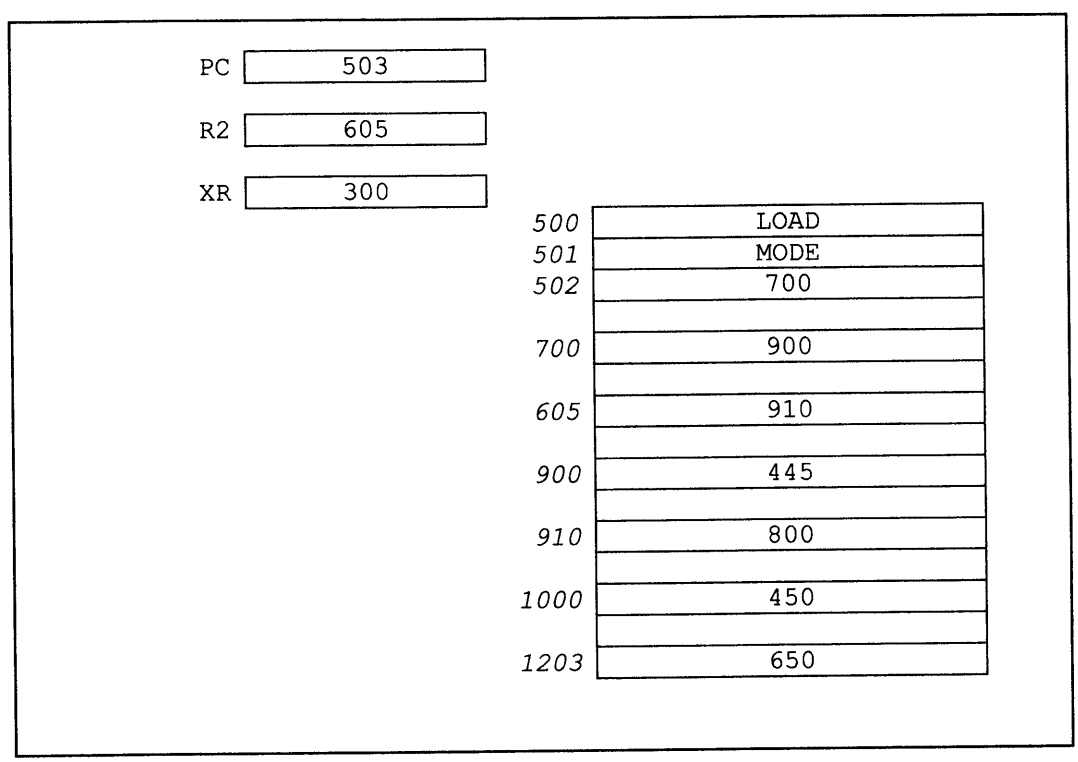

FIGURE Q4

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) Register Addressing Mode

(ii) Register Indirect Mode

(iii) Relative Addressing Mode

(iv) Indexed Addressing Mode

(8 marks)

(b) Discuss **SIX (6)** steps instruction pipeline.

(12 marks)

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

(2 marks)

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

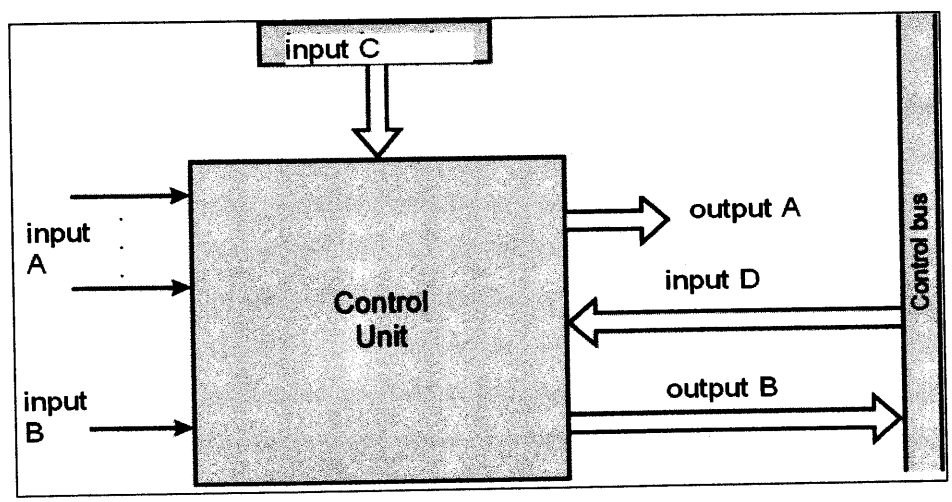

FIGURE Q5

(18 marks)

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	$A\bar{A} = 0$	$A + \bar{A} = 1$
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	$\overline{AB} = \bar{A} + \bar{B}$	$\overline{A + B} = \bar{A}\bar{B}$

-END OF QUESTIONS-