UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
SEPTEMBER 2016 SEMESTER

COURSE CODE	: LEB 40503
COURSE NAME	: MICROPROCESSOR
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	: BACHELOR OF ENGINEERING TECHNOLOGY (HONS) IN MARINE ELECTRICAL & ELECTRONIC
DATE	: 20TH JANUARY 2017
TIME	: 9.00 AM – 12.00 PM
DURATION	: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. Answer FOUR (4) questions ONLY.
4. Please write your answers on the answer booklet provided.
5. Answer should be written in blue or black ink except for sketching, graphic and illustration.
6. Answer all questions in English language ONLY.

THERE ARE 7 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR questions ONLY.
Please use the answer booklet provided.

Question 1

(a) Solve the equation $@3[(\$9F \div 5) - (42 \div \$8)]$ using radix minus two method. Present your final answer in hexadecimal number. *(Show your calculation method).*
(CLO1, C3)

(10 marks)

(b) Analyze the following program in Figure 1 and answer the questions below.
(CLO2, C4)

```
                                1 ; ******** Main Program ***************
00002000                        2               ORG     $2000
00002000  4FF8 6000             3 START         LEA     $6000,SP
00002004  3F39 00003000         4               MOVE.W  NUM1,-(SP)      ;Push first param
0000200A  3F39 00003002         5               MOVE.W  NUM2,-(SP)      ;Push 2nd param
00002010  3F39 00003004         6               MOVE.W  NUM3,-(SP)      ;Push 3rd param
00002016  4EB9 00002500         7               JSR     MUL3
0000201C  DFFC 00000006         8               ADDA.L  #6,SP           ;Clean the stack!
00002022  60FE                  9 HABIS         BRA     HABIS
                                10 ; ******* Subroutine Mul3 **************
00002500                        11              ORG     $2500
00002500  302F 0004             12 MUL3         MOVE.W  4(SP),D0        ;D0 = NUM3
00002504  C1EF 0006             13              MULS.W  6(SP),D0        ;D0 *= NUM2
00002508  C1EF 0008             14              MULS.W  8(SP),D0        ;D0 *= NUM1
0000250C  4E75                  15              RTS                     ;SP --> rtrn addr!
00003000                        16              ORG     $3000
00003000  0005                  17 NUM1         DC.W    5
00003002  0009                  18 NUM2         DC.W    9
00003004  0003                  19 NUM3         DC.W    3
00003006                        20              END     $3000
```

Figure 1

i. Determine the value of Stack Pointer and Program Pointer after the instruction at line **4** is executed.

(2 marks)

ii. Determine the value of Stack Pointer and Program Pointer after the instruction at line **7** is executed.

(2 marks)

iii. Determine the value of Stack Pointer and Program Pointer after the instruction at line **12** is executed.

(2 marks)

iv. Determine the value of Stack Pointer and Program Pointer after the instruction at line **15** is executed.

(2 marks)

(c) Write a sequence of instructions to calculate the summation of 50 numbers using a loop. **(CLO3, C6)**

(7 marks)

Question 2

(a) Solve the equation ($5D_{16}$ x $2D_{16}$) - ($1100\ 1100_2 \div C_{16}$) in binary number. Present your answer in decimal number. *(Show your calculation method).* **(CLO1, C3)**

(10 marks)

(b) Analyze what happen at states S0, S1, S2, S6 and S7 of the timing diagram as shown in Figure 2. **(CLO2, C4)**

(6 marks)

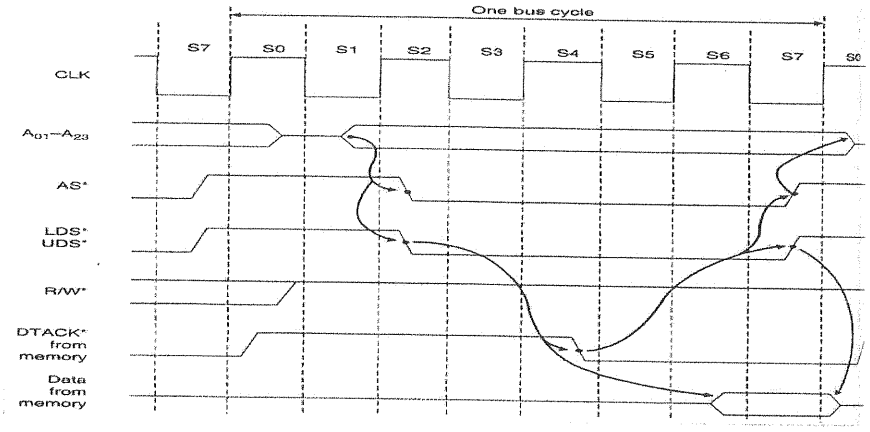

Figure 2

(c) Write a program to calculate the Equation 1 below. **(CLO3, C6)**

$$\sum_{i=0}^{9} i^2 \qquad \text{Equation 1}$$

(9 marks)

Question 3

(a) Examine the effect of the 68000's shift instructions in Table 1 below to the status of Condition Code Register (CCR). **(CLO1, C3)**

(10 marks)

Table 1

No.	Shift Instruction	Initial Value	After First Shift	NZVC
i.	ASL	0111 1110		
ii.	ASR	1110 1011		
iii.	LSL	1110 1011		
iv.	LSR	1110 1011		
v.	ROL	0111 1110		

(b) Analyze the procedure taken by 68000 in handling bus error occasion. **(CLO2, C4)**

(8 marks)

(c) Convert the following flowchart in Figure 3 into assembly language. All the data register shown in the diagram are the byte size. **(CLO3, C4)**

(7 marks)

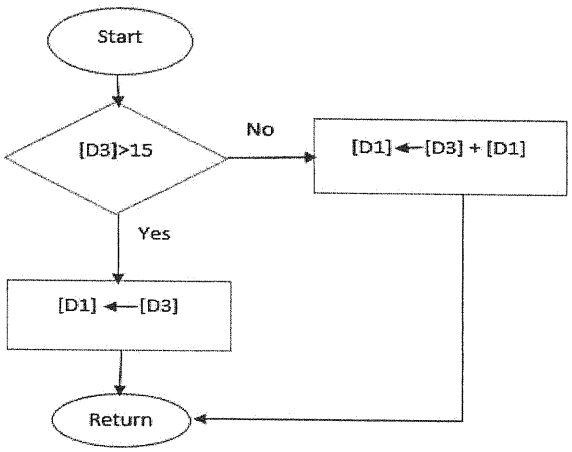

Figure 3

Question 4

(a) 64kbytes of EPROM with a starting address of $60 0000 and 32kbytes of RAM with base address of $E0 0000 need to be interfaced to a 68k-based system. Design the decoder circuit. **(CLO1, C6)**

(10 marks)

(b) Explain the procedures for handling system bus to bus master. **(CLO2, C5)**

(5 marks)

(c) Create a subroutine that will calculate the Body Mass Index (BMI). The formula for BMI is given in Equation 2. **(CLO3, C6)**

$$BMI = \frac{Weight\ (kg)}{Height\ (cm) \times Height(cm)} \quad \text{Equation 2}$$

(10 marks)

Question 5

(a) Design a partial address decoder for 68000 based system that contains 2MB of RAM at a starting address $20 0000 using 256k x 8 chips. **(CLO1, C6)**

(10 marks)

(b) Explain the sequence of events for the write cycle in 68000. **(CLO2, C5)**

(6 marks)

(c) Write a sequence of instructions to calculate the summation of bit 1 in data register D0. The summation of bit is stored in data register D1. **(CLO3, C6)**

(9 marks)

END OF QUESTIONS