UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2010/2011

COURSE NAME	:	DIGITAL ELECTRONICS
COURSE CODE	:	DEE 2123
PROGRAMME	:	2 DEE / DET
EXAMINATION DATE	:	APRIL/MAY 2011
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER (**FIVE**) 5 QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **(EIGHT)** 8 PAGES

Q1 (a) What is the difference between digital and analog quantities ? Give an example for each quantity .

(4 marks)

(b) Explain two advantages of using digital technique and give a reason to support each explanation.

(8 marks)

(c) Convert the following numbers:

(i) 01001011_2 to decimal
(ii) $0100\ 0101_{BCD}$ to decimal
(iii) 87_{10} to hexadecimal
(iv) 87.125_{10} to binary

(8 marks)

Q2 (a) Write the truth table and Boolean expressions for AND and OR gates.

(4 marks)

(b) Sketch the output waveforms for the NAND and NOR gates with the given input waveforms in Figure Q2(b).

(6 marks)

(c) Write down the Boolean expression for the output Z for the circuit in Figure Q2(c).

(4 marks)

(d) Draw the logic circuits which will implement this logic function.

$$(\overline{A}C + B) + \overline{A}CD(C + \overline{B})$$

(6 marks)

Q3 (a) Write down DeMorgan's theorem.

(2 marks)

(b) Apply the laws and theorems of Boolean and DeMorgan to simplify each of the following logic equations:

(i) $F = (\overline{A} + B).A\overline{C} + \overline{A.B.C}$

(ii) $F = \overline{\overline{(A + \overline{B})}(C + D)}$

(7 marks)

(c) From the truth table shown in Table Q3(c):

(i) Use Boolean algebra to find the simplified equation for Z in the sum-of-products form.

(ii) Draw the simplified circuit using NAND gates only.

(11 marks)

Q4 (a) From each of the Karnaugh maps in Figure Q4(a), obtain the minimum SOP expressions.

(10 marks)

(b) From the truth table shown in Table Q4(b):

(i) Write the standard sum of product (SOP) equation.
(ii) Write the standard product of sum (POS) equation.
(iii) Use a K map to obtain the minimum SOP and POS equations
(iv) Will the SOP circuit produce the same output as the POS circuit? Why ?

(10 marks)

Q5 (a) Determine the largest decimal number that can be represented with :

(i) 8-bit unsigned binary
(ii) 8-bit signed binary
(iii) 8-bit BCD

(6 marks)

(b) The following are 8-bit two's-complement binary numbers. Calculate their sums and express the results in decimal. State if there is any overflow in the sums.

(i) 01011111 + 00100001

(ii) 00010110 + 11111111

(6 marks)

(c) Compare the binary and Gray code values for the decimal 31 and 32 sequence. What characteristic is most important about the Gray code ?

(8 marks)

Q6 (a) Draw the truth table of a half adder, obtain the Boolean expressions for the SUM and CARRY outputs and then draw the resulting logic circuit.

(5 marks)

(b) Produce a truth table for a full adder. Use the Karnaugh map method to simplify the Boolean expressions for the SUM and CARRY outputs. Then draw the resulting minimum circuit.

(10 marks)

(c) Show that a full adder circuit can be constructed using two half adders.

(5 marks)

Q7 (a) What is the function of :

(i) a decoder
(ii) an encoder

(6 marks)

(b) Describe an application of the decoder and encoder.

(4 marks)

(c) With the aid of a circuit diagram and truth table, describe the operation of a 3-line-to-8-line active LOW output decoder

(10 marks)

FINAL EXAMINATION

SEMESTER /SESSION : I I / 2010/2011 PROGRAMME : 2 DEE / DET
COURSE : DIGITAL ELECTRONIC COURSE CODE : DEE2123

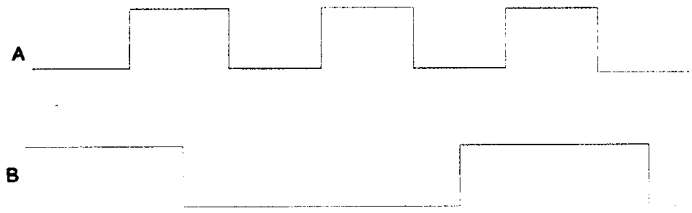

Figure Q2(b)

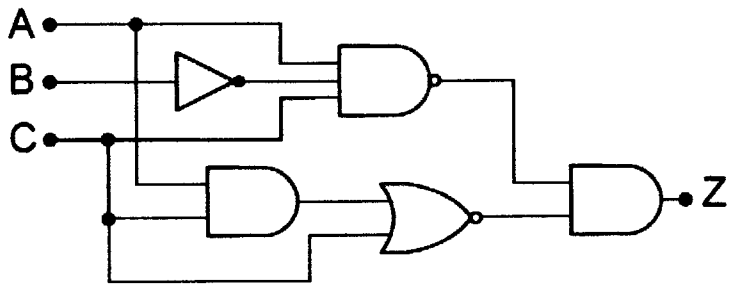

Figure Q2(c)

FINAL EXAMINATION

SEMESTER /SESSION : I / 2010/2011
COURSE : DIGITAL ELECTRONIC
PROGRAMME : 2 DEE / DET
COURSE CODE : DEE2123

Table Q3(c)

A	B	C	Z
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

FINAL EXAMINATION

SEMESTER /SESSION : I / 2010/2011
COURSE : DIGITAL ELECTRONIC
PROGRAMME : 2 DEE / DET
COURSE CODE : DEE2123

A·B \ C·D	00	01	11	10
00	1	1	1	1
01	1	1	0	0
11	0	0	1	0
10	0	0	1	1

(i)

A·B \ C·D	00	01	11	10
00	0	0	X	0
01	1	1	X	0
11	1	1	X	X
10	1	0	X	X

(ii)

Figure Q4(a)

FINAL EXAMINATION

SEMESTER /SESSION : I / 2010/2011 PROGRAMME : 2 DEE / DET
COURSE : DIGITAL ELECTRONIC COURSE CODE : DEE2123

Table Q4(b)

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0