ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

SEMESTER II EXAMINATION, 2016/2017 ACADEMIC SESSION

COURSE TITLE: ELECTRONIC CIRCUIT II

COURSE CODE: EEE 322

EXAMINATION DATE: 26th JULY 2017

COURSE LECTURER: Dr. K. Temikotan

HOD's SIGNATURE

TIME ALLOWED: 2 hours 30 mins

INSTRUCTIONS:

1. ANSWER ANY FIVE QUESTIONS
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE **NOT** ALLOWED TO BORROW CALCULATORS AND ANY OTHER WRITING MATERIALS DURING THE EXAMINATION.
4. STATE CLEARLY THE COMBINED STOPPING CONDITIONS USED IN YOUR SOLUTIONS

Question #1

a. Design the simplest circuit that implements the following function using only NAND gates

$$f(A, B, C) = \sum m(3,4,6,7)$$ **(8 marks)**

b. In the diagram Fig Q1, the box represents a logical element which produces a TRUE output only when majority of the three inputs W, X, and Y are TRUE. Express Z as sum of products of the input variables. Draw an equivalent logical diagram for the box. **(12 marks)**

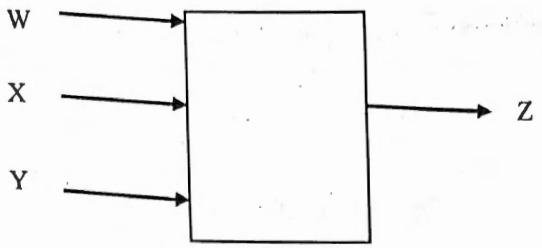

Fig Q1 for Question 1

Question #2

a. The wave patterns show the inputs A and B and the output X from a basic logic gate. Identify the logic gate used and draw the truth table for the gate **(6 marks)**

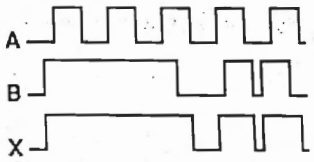

Fig Q2 for Question 2

b. A chemical process requires that temperature T and pressure P be monitored so that an alarm sounds as and when either temperature or pressure exceeds reference values. Draw a block diagram of the system showing the logic to activate the alarm. Use a truth table to illustrate the condition of operation of the system. Clearly explain how the system operates. **(14 marks)**

Question #3

a. Find the 2's complement of -20; and 26 **(10 marks)**

b. Convert 127_{10} to

   i. BCD code **(5 marks)**

   ii. Hexadecimal **(5 marks)**

Question #4

a. Derive a Boolean expression for the logic circuit shown in Fig. Q4 **(6marks)**

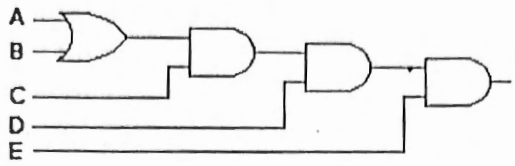

Fig Q4 for Question 4

b. Given the truth table (Table Q4) below,

i. Express X and Y in products of maxterms;

ii. Obtain the simplified function in the sum of product form using Karnaugh map **(14 marks)**

Table Q4 Truth Table for Question 4

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

Question #5

a. Prove using any suitable method that;

$f(A\,B\,C\,D) = ABCD + AB\bar{C}\bar{D} + ABC\bar{D} + AB\bar{C}D + ABCDE + AB\bar{C}\bar{D}\bar{E} + AB\bar{C}DE$ can be simplified to AB. **(8 marks)**

b. A circuit that controls a given digital system has three inputs: x_1, x_2 and x_3. It has to recognise three different conditions:

- Condition A is true if x_3 is true and either x_1 is true or x_2 is false
- Condition B is true if x_1 is true and either x_2 or x_3 is false
- Condition C is true if x_2 is true and either x_1 is true or x_3 is false

The control circuit must produce an output of 1 if at least two of the conditions A, B and C are true. Design the simplest circuit that can be used for this purpose. **(12 marks)**

Question #6

a. Design a 4-bit ring counter and explain briefly how the device can be used to control a sequence of operations. **(7 marks)**

b. Why is a parallel counter faster than a ripple counter? **(2 marks)**

c. i. What is multiplexing? Illustrate your answer using a neat diagram **(4 marks)**

ii. Write out five applications of multiplexers **(5 marks)**

iii. What is the difference between a decoder and demultiplexer? **(2 marks)**

Question #7

a. A clocked JK flip flop is connected such that J=K=1. Draw the flip flop and its truth table. **(4 marks)**

b. A ripple counter uses flip-flops having total propagation delay of 12 nano-seconds. If the counter is to be operated at 10MHz, how many flip-flops are required? What can be the highest MOD counter thus constructed? **(12 marks)**

c. Using a neat sketch to show the distinction between a combinational circuit and a sequential circuit. **(4marks)**