(18)

(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

SUPPLEMENTARIES/SPECIAL EXAMINATIONS
YEAR ONE SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF INFORMATION TECHNOLOGY

COURSE CODE : BIT124

COURSE TITLE : DIGITAL ELECTRONICS

DATE: 17/10/2018 **TIME: 8.00A.M. – 10.00A.M.**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE-COMPULSORY (30marks)

a) Distinguish between Multiplexers and demultiplexers [1 mark]

b) Convert the binary number $1010\ 1011.01111_2$ to;

i) Hexadecimal [2 marks]

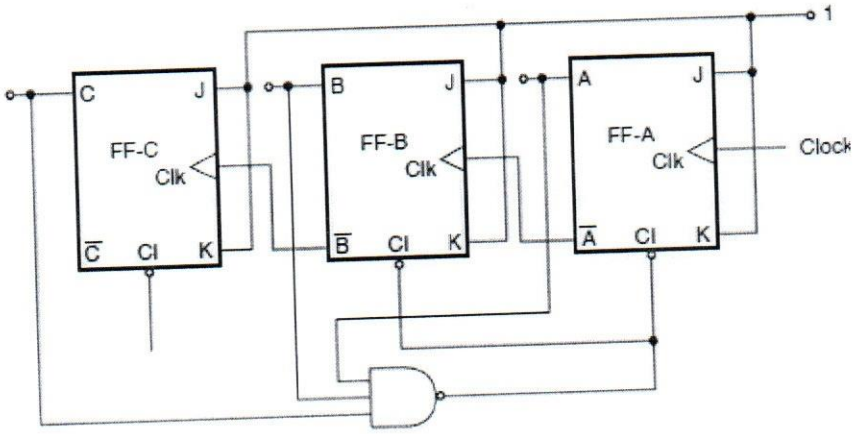
ii) Decimal [2 marks]

c) Convert hexadecimal number A25C. 2A to;

i) Binary [2 marks]

ii) Octal [2 marks]

d) Refer to the counter schematic shown in the figure below.



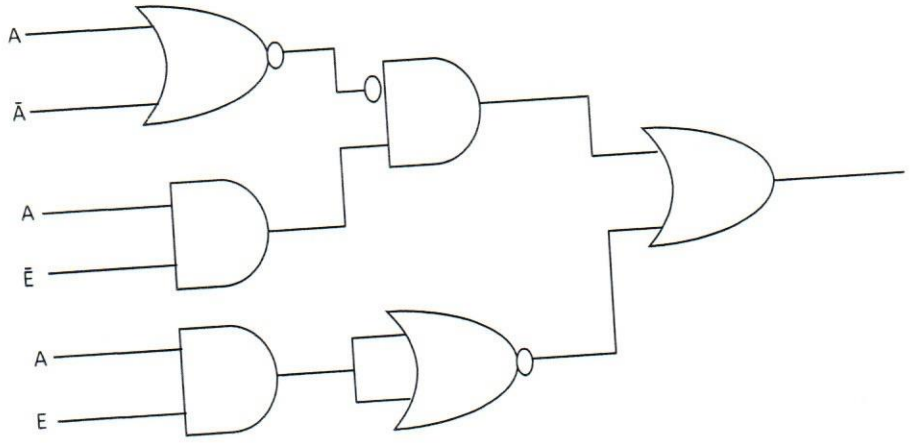
i) Sketch t [3 marks]

ii) Determine the count sequence of this counter [2 marks]

e) Determine SOP expression from the Karnaugh map shown below [3 marks]

	$\overline{C}\,\overline{D}$	$\overline{C}D$	CD	$C\overline{D}$
$\overline{A}\,\overline{B}$	1	1		1
$\overline{A}B$		1		
AB				
$A\overline{B}$	1	1		1

f) Determine the Boolean expression from the logic circuit shown below [3 marks]



g) Simplify the following Boolean function obtained in (f) above to a minimum number of literals [3 marks]

h) Obtain a truth table for the minimized logic circuit in 1(g) above [3 marks]

i) Explain the application of magnitude comparator [4 marks]

QUESTION TWO

a) Describe the operation of a decoder [6 marks]

b) Using a logic circuit, illustrate how a comparator is used in testing of equality [3marks]

c) Explain the operation of half- adder circuit as an arithmetic circuit [6 marks]

d) Using relevant circuit diagram demonstrate synchronous parallel transfer of data from three bit register to another using J-K flip flops. [4 marks]

QUESTION THREE

a) Design a digital logic circuit to produce a 50 Hz output signal from an input signal of 3.2 KHz. [4 marks]

b) With the help of clocked JK flip flops and waveforms, explain the working of a MOD-8 down counter [5 marks]

c) List any three applications of de-multiplexers [3 marks]

d) Explain the operation of a decoder circuit [4 marks]

e) Explain how a decoder is used in the following areas

i) Computer memory [2 marks]

ii) Input/Output device addressing [2 marks]

QUESTION FOUR

a) Explain any two applications for each of the following electronic circuit components

i) Capacitors [2 marks]

ii) Diodes [2 marks]

b) Using appropriate logic circuit diagram design a MOD 6 counter [5 marks]

c) use the truth table below to answer questions (i)-(iii)

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

i) Write down the unsimplified Boolean expression [3 marks]

ii) Use a Karnaugh map to minimize the Boolean expression [3 marks]

iii) Implement the circuit from the minimized expression [2 marks]

QUESTION FIVE

a) Briefly describe the operation of a Multiplexer [4 marks]

b) Using appropriate logic circuit diagram design a MOD 6 counter [5 marks]

c) The control circuit of a photocopier has four switches (A,B,C and D) placed along the path to detect a paper jam. Each switch is a normally open and as a paper passes over it, the switch closes. It is impossible for switch A and D to close at the same time

The control circuit produces a HIGH output whenever two or more switches are closed at the same time to indicate a paper jam. The HIGH output sounds an alarm to alert the operator.

i) Draw the truth table that satisfies the condition for sounding the alarm [3 marks]

ii) Draw a karnaugh map from the results of the truth table [3 marks]

iii) Obtain the switching formula from the K-map [3 marks]

iv) Implement the circuit by using only NAND gates [2 marks]