(Knowledge for Development)

KIBABII UNIVERSITY
(KIBU)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATION

FIRST YEAR SECOND SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELORS OF SCIENCE IN

(INFORMATION TECHNOLOGY)

COURSE CODE: BIT 124

COURSE TITLE: DIGITAL ELECTRONICS

DATE: 27/07/2022 **TIME:** 8.00 A.M. – 10.00 A.M. **2HRS**

INSTRUCTIONS TO CANDIDATES:
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

Paper Consists of 4 Printed Pages. Please Turn Over

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]

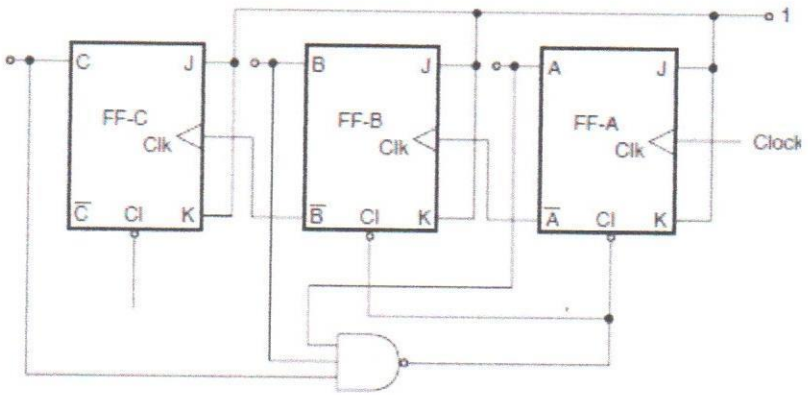
ii) Decimal [2 marks]

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.



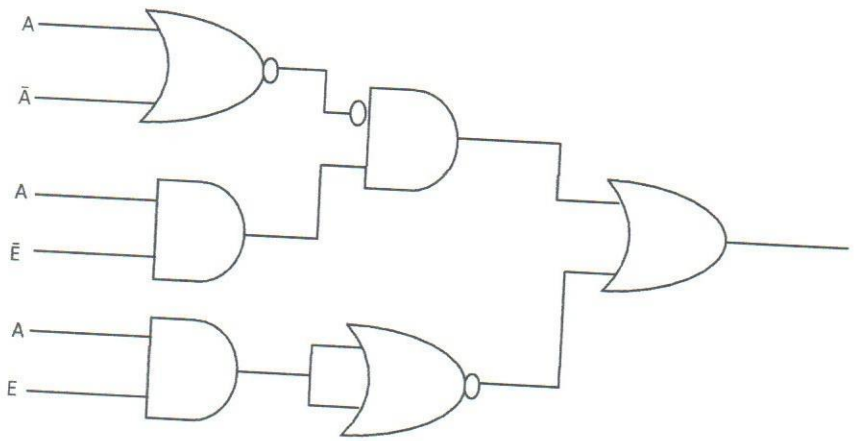
i) Sketch the wave forms for the output of the flipflops [3 marks]

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 (20 MARKS)

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

b) Using a logic circuit, illustrate how a comparator is used in testing of equality [4 marks]

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 (20 MARKS)

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 (20 MARKS)

a) A water tank feeds three separate processes. When any two of the processes are in operation at the same time, a signal is required to start a pump to maintain the head of water in the tank. Devise a logic circuit using **nor**-gates only to give the required signal. [4 marks]

b) Describe any two applications of de-multiplexers [4 marks]

c) Explain the following terms in relation to logic families;

i) Power dissipation [2 marks]

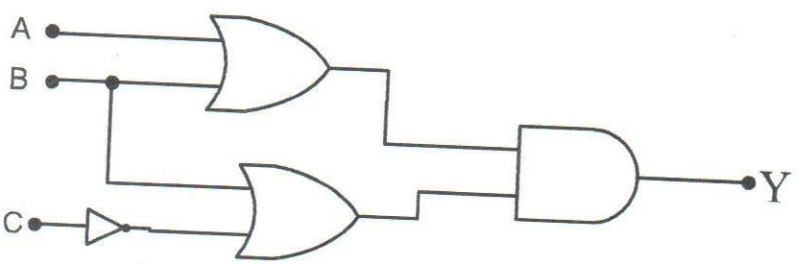
ii) Noise immunity [2 marks]

d) Standardize the expression $Y = (AB)' + A'BC + BC'$ [4 marks]

e) Implement a truth table that satisfies the result in 4(d) above [4 marks]

QUESTION FIVE (20 MARKS)

a) Derive a truth table for the circuit below. [4 marks]



b) Describe the operation of flip flops in frequency division circuits [6 marks]

c) Explain any three applications of decoder circuits [6 marks]

d) Differentiate between multiplexers and de-multiplexers [4 marks]