MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (TELECOMMUNICATION AND INFORMATION TECHNOLOGY)

SPH 207: DIGITAL ELECTRONICS AND DEVICES

DATE: 3/5/2019 **TIME: 8.30-10.30 AM**

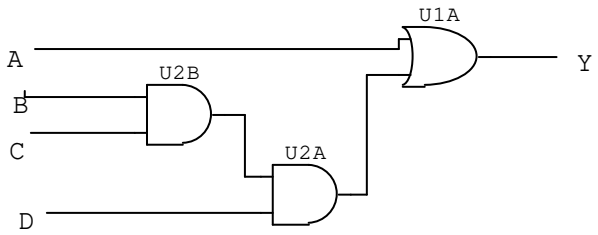
INSTRUCTIONS

Answer Question ONE and any other TWO Questions.

QUESTION ONE (30 MARKS)

a) Find the boolean expression for the out put of fig below and compute the output value when

A=0 ,B=1,C=0 and D=1



(5 marks)

b) i Differentiate between decimal number systemand hexadecimal number system hence convert $A031_{16}$ to its decimal eqivalent. (5 marks)

ii. Using 2's compliment subtract 1010_2 from 1101_2 (2 marks)

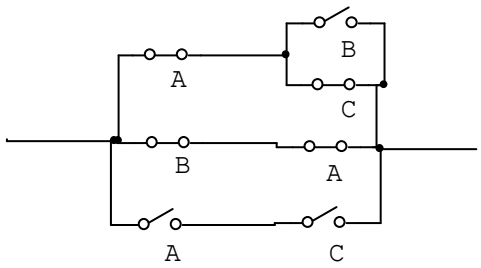
iii. Design a circuit to convert 3 bit binary numbers into grey code. (6 marks)

iv. describe any three characteristics of logic families. (6 marks)

v. by use of S-R flip flop,draw a diagram that would be applied in a design of a barglar alarm consisting of a series switches connected to doors and windows throughout a bulding such that opening any door or window opens the corresponding switch which should sound thge alarm (6 marks)

QUESTION TWO (20 MARKS)

a) Derive a logic expression from the relay switching circuit of the figure below and minimize it as far as possible hence draw the equivalent simplified logic diagram.



(6 marks)

b) Define the following terms used in CMOS devices

i. Propagation delay

ii. Set up time

iii. Hold time (3 marks)

c) Sketch the transfer characteristic of a TTL gate. (4 marks)

d) Explain the difference between a 7400 and 5400 devices (3 marks)

e) Describe the operation and function of a schmitt triger. (4 marks)

QUESTION THREE (20 MARKS)

a) From the truth table below,derive

i. logic expression for f

ii. simplify the expression as far as possible

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

iii. draw the logic diagram to imlement this (8 marks)

b) a digital system is to be designed with two inputs and three outputs.the system should function under the following conditions

i. output *x* indicates the absence of both inputs

ii. output *y* indicates the presence of either input and absence of the other.

iii. Out put *z* indicates the the presence of both inputs. Using logicequitions and truth table:

I. Draw the logic diagram for the system using the minimum number of gates

II. Modify your lologic diagram to its simlest form using NAND gates only.

(12 marks)

QUESTION FOUR (20 MARKS)

a) Define the terms bistable,monostable and astable multivibrators (3 marks)

b) Design a modulo-5asynchronous counter using a J-K negative going edge triggerd flip flops (5 marks)

c) Explain the advantages and disadvantages of CMOS logic compaired to NMOS (6 marks)

d) In an S-R bistable formed using two NOR gates , are the inputactive high or low? Draw the transition table and a karnaurgh mapof such a circuit. (6 marks)

e) Explain two diffrence between digital to anlogue and analogue to digital converters. (6 marks)

QUESTION FIVE (20 MARKS)

a) Identify two main components of a typical data aquisition system. (2 marks)

b) Explain the use of sample and hold gates in analogue input /outputsystems. What is meant by the term 'droop' when applied to such gates. (3 marks)

c) A signal has a frequency spectrum which extends as high as 2khz.what is the minimum rate at which this signal may be sampled to obtain a good representation of its form.what would be the effect of sampling below this rate. (3 marks)

d) Show how a power sourse, a lamp and a number of switches can be used to represent the following logical functions.

i. L=A.B.C

ii. L=A+B+C

iii. L=(A.B)+(C.D)

iv. L=A+B (12 marks)