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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2017 /2018 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: **COM 212**

COURSE TITLE: **DIGITAL ELECTRONIC 1**

DATE: 10TH DECEMBER, 2018 **TIME: 9AM – 12.00 NOON**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

THIS PAPER CONSISTS OF 5 PRINTED PAGES **PLEASE TURN OVER**

INSTRUCTIONS TO CANDIDATES

i. *Answer **ALL** Questions from section A and any other **THREE** questions.*

ii. *Maps and diagrams should be used whenever they serve to illustrate the answer*

iii. *Do not write on the question paper*

SECTION A (24 MARKS) COMPULSORY

QUESTION ONE (12 Marks)

a) Perform the following arithmetic on the number systems indicated:

i) 5 3 4 (7) + 4 3 6 (7)

ii) F 5 A C H – 9 E 4 8 H

iii) -7 6 5 (8) + 5 2 7 (8)

iv) 2 7 E . D 5 H + 4 B F . C 8 H (6 Marks)

b) Use 2's complement to subtract B from A in the following :

i) A = 1 1 0 0 0 1 (2); B = 1 0 0 1 1 (2)

ii) A = 1 0 1 0 1 1 (2); B = 1 1 0 0 1 1 (2) (6 Marks)

QUESTION TWO (12 Marks)

a) Draw and label the logic symbol and truth table for each of the following 2–input logic gates:

i) NAND ii) Exclusive–OR (XOR) (4 Marks)

b) Determine the inverse (complement) and dual of the following logic expressions. (Do not simplify)

i) X = AB + BC

ii) Y = (A + B) • (B + C) (4 Marks

c) Compute the following

i) 10's complement of 6 3 8 4 7

ii) 8's complement of 5 2 7 (8) (4 Marks)

SECTION B (36 MARKS)

QUESTION THREE (12 Marks)

Copy and fill in appropriately the coding systems given in table Q1(f) (12Marks)

Clearly show all your working.

2		
DECIMAL	BINARY	OCTAL
		(BASE-8)
		HEXADECIMAL
		(BASE-16)
		GRAY CODE
EXCESS-3		8421 BCD
5		6
1 1 0 0 1 1		
1 0 1 1 0 1 0 1		

Table Q1(f)

QUESTION FOUR(12 Marks)

a) (i) What are universal gates? (2 Marks)

(ii) List the names of the two universal gates and state clearly how each is used.

(4 Marks)

b) a) i) Draw a well-labeled circuit diagram of a clocked D-type flip-flop using NAND-gates only.

ii) Give the truth-table of the flip-flop (2 Marks)

b) If a 3.2 KHz clock signal is divided using some binary flip–flops to produce a 50 Hz output signal,

find the number of flip–flops required. (2 Marks)

c) Draw the logic circuit diagram, with its corresponding truth-table, for an R-S flip-flop using 2-

input NOR gates only. (2Marks)

QUESTION FIVE (12 Marks)

Using the filled table in part (b) write down the function F in terms of

i) standard Sum-of-Products (SOP)

ii) standard Product-of-Sums (POS)

iii) the equivalent digits of the minterms

iv) the equivalent digits of the maxterms (12 Marks)

QUESTION SIX(12 Marks)

a. A 4–input digital system sounds an alarm when two or more inputs are logical 1. (The alarmsounds if the output X is a logical 1)

i) Draw the truth-table for the alarm system.

ii) Develop a standard SOP expression from the truth-table.

iii) Using the K-map, minimize the SOP expression. (6 Marks)

b. A digital system is given by the function

Y(A, B,C,D) = ?M(1,5,8,9,12,13,14,15)

Draw the truth-table for the function and express the function Y in terms of;

i) its minterms ii) its Maxterms (4 Marks)

c) Draw two separate K-maps of the function Y in part (b) and then use them to determine;

i) the simplified POS form of Y

ii) the simplified SOP form of Y (2 Marks)

QUESTION SEVEN(12 Marks)

A logic function is expressed as F(A,B,C) = ?M (0 , 2 , 3 , 7)

i) Derive the standard POS expression of the function F.

ii) Draw the K-map for function F.

iii) Use the K-map and derive the simplified POS expression of the function F.

iv) Hence or otherwise derive the simplified SOP expression of the same function

(8 Marks)

c) Draw the circuit diagram of the following logic function using 2–input NOR, AND, OR gates only.

(Do not use NOT-gates)

$X = A\,B + A\,C + B\,C$ (4 Marks)

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