

KENYA METHODIST UNIVERSITY

1st TRIMESTER EXAMINATION

April 2008

FACULTY : **SCIENCE & SOCIAL STUDIES**
DEPARTMENT : **COMPUTER & INFORMATION SCIENCE**
COURSE CODE : **COMP 302**
COURSE TITLE : **Digital Electronics**
TIME : **2 HRS**

Instructions: Attempt Question 1 in **Section A** and any other two questions in **Section B**.

SECTION A

QUESTION 1 (20 Mks)

1. Giving examples, differentiate between Analog and Digital Quantities. State the advantages of Digital Quantities. (4 Mks)
2. If a certain computer has 128 Kbytes of memory, how many bits (binary digits) of information can it store? (2 Mks)
3. Given that the
 - amplification (or gain) of the audio amplifier in the above figure is 100
 - signal voltage output of the radio detector (V_o) is 0.1 volt
 - The resistance of the speaker is 4 ohms,

Determine how much power is delivered to the speaker with the volume control set at

- Full volume
- One-half volume
- One-tenth volume

Use $P = \frac{E^2}{R}$ where P is the power in watts, E is the EMF in volts, and R is the resistance in ohms. (4 Mks)

4. Find the Decimal Value of the following Binary Number: 101110_2 (2 Mks)
5. Convert 87_{10} to its binary equivalent (2 Mks)
6. Convert the Hex number $3C_{16}$ to its binary and decimal equivalent. (4 Mks)
7. Convert 369_{10} to BCD (2 Mks)

SECTION B

QUESTION 2 (20 Mks)

Show

1. $a \cdot (\bar{a} + b) = a \cdot b$
2. $a + (\bar{a} \cdot b) = a + b$ (4 Mks)

3. Prove the absorption rule:

$$a + a \cdot b = a \quad (2 \text{ Mks})$$

4. Simplify

$$x \cdot a + \bar{a} \cdot z + x \cdot z + x \cdot a \cdot z \quad (4 \text{ Mks})$$

Define the term flipflop (1 Mk)

Differentiate between simple and clocked flipflops (2 Mks)

List any two uses of flipflops (2 Mks)

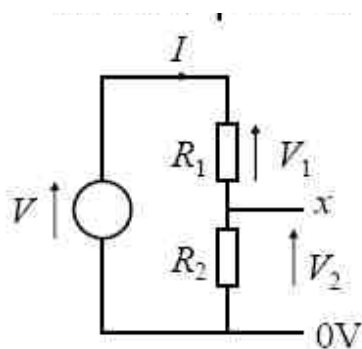
Briefly describe any two types of flip-flops (5 Mks)

Question 3 (20 Mks)

- a) Show that $\overline{a + b} = \bar{a} \bar{b}$ (3 Mks)
- b) Using De-Morgan's theorem simplify $(a \cdot b \cdot (c + \bar{b} \cdot d) + \bar{a} \cdot b) \cdot c \cdot d$ (5 Mks)
- c) Implement the function $f = a \cdot b + c \cdot d$ using De – Morgans in Gates (10 Mks)
- d) Explain what a Karnaugh map is. (2 Mks)

Question 4

- a) What is the voltage at point x relative to the 0V point? (5 Mks)



- b) f is defined by the following truth table. List all its min – terms. Consequently express f in its Disjunctive Normal Form (DNF). **(10 Mks)**

x	y	z	f
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

- c) Express the following statement in terms of
- (i) Logical (Boolean) expression.
 - (ii) Symbolic gates.

If chimney is not blocked and the house is cold and the pilot light is lit, then open the main fuel valve to start boiler **(5 Mks)**