



**ELIZADE UNIVERSITY ILARA MOKIN, ONDO  
STATE**

**FACULTY OF ENGINEERING  
DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

**COURSE TITLE: MEASUREMENTS AND INSTRUMENTATION**

**COURSE CODE: EEE 311**

**EXAMINATION DATE: 24<sup>TH</sup> MARCH, 2021**

**COURSE LECTURER: DR O. K. OGIDAN**

A handwritten signature in blue ink, enclosed within a rectangular box. The signature is stylized and appears to be 'O. K. Ogidan'.

**HOD's Signature**

**TIME ALLOWED: 3 HOURS**

### **INSTRUCTIONS**

- a. ANSWER QUESTION 1 ANY OTHER FOUR (4) QUESTIONS.
- b. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
- c. YOU ARE NOT ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.

### Question 1 [24 marks]

a.) Define the following as it relates to the performance of a system

- i.) Calibration
- ii.) Rectifier
- iii.) Rise time
- iv.) Transducer

(4 marks)

b.) i.) What do you understand by error? (1 mark)

ii.) Discuss briefly 2 sources of error that occurs in an instrumentation system and how to guide against them (2 marks)

c.) i.) What are the differences between analog and digital instruments (2 marks)

ii.) As an instrumentation engineer, discuss three areas in which you consider your skills are relevant to the society. Include diagrams where necessary. (6 marks)

d.) Describe briefly the constituent elements of an instrumentation system (3 marks)

e.) For the double beam oscilloscope shown in figure 1a, determine: (6 marks)

i.) frequency ii.) r.m.s values iii.) phase difference

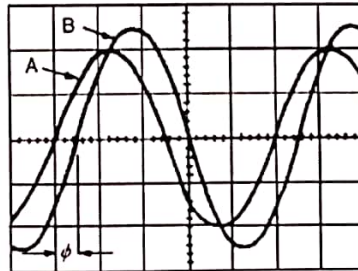


Fig. 1a: Double beam oscilloscope

### Question 2 [12 marks]

a.) Define the following as it relates to the performance of a system

- i. Accuracy
- ii. Sensitivity
- iii. Range



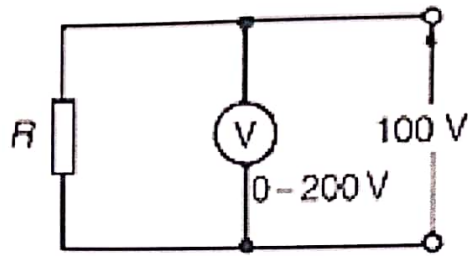


Figure 2

**Question 4 [12 marks]**

- a.) What is the main difference between microcontroller and microprocessor? (2 marks)
- b.) You are a power system engineer in a developing power distribution company. The power generation available to you is not enough - just one third ( $1/3$ ) of the power required for the city. As a result, there is the need for load-shedding. The city under your control had been grouped into four divisions namely:
- Residential area = pin 3
  - Industrial area = pin 4
  - Commercial area = pin 7
  - University Teaching Hospital = pin 6
- i.) Prepare in a tabular form how you will implement a load-shedding activity within a period of twenty four (24) hours. (*Hint: use 1 second to represent 1 hour*) (3 marks)
- ii.) Draw a flowchart of the program you have written to implement the load shedding (2 marks)
- iii.) Write a program or pseudocode that will implement the load-shedding plan using Atmega 328 microcontroller. (5 marks)

**Question 5 [12 marks]**

- a.) What is an oscilloscope? (1 marks)
- b.)

b.)

i.) Distinguish between a multi-meter and an oscilloscope.

(1 marks)

ii.) Mention three uses of an oscilloscope

(3 marks)

c.) A pulse waveform is displayed by an oscilloscope is shown in Figure 3. The time/cm switch is 50ms/cm and the 'Volts/cm' switch is on 0.2 V/cm, determine:

i.) The periodic time, ii.) frequency, iii.) the magnitude of the pulse voltage

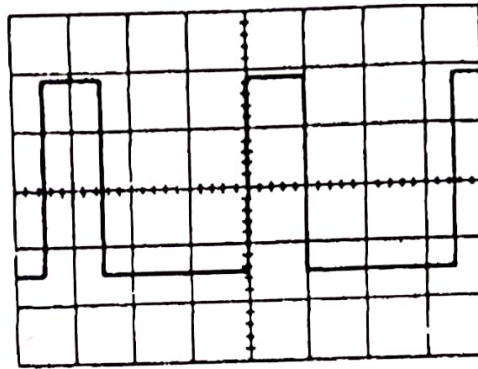


Figure 3

(7 marks)

### Question 6 [12 marks]

a.) With the aid of a suitable diagram, describe the operation of a moving iron coil (attraction type) (2 marks)

b.) How will you convert a galvanometer to an ammeter? (2 marks)

c.) How will you convert a galvanometer to a voltmeter? (2 marks)

d.) Calculate the power dissipated by the voltmeter and by the resistor in figure 4 when

i.)  $R=250 \Omega$

ii.)  $R=2 M\Omega$ .

Assume that the voltmeter sensitivity (sometimes called figure of merit) is  $10 k\Omega/V$ . (6 marks)

**Question 7 [12 marks]**

- a.) Mention four electrical or electronic measuring instruments and their uses (2 marks)
- b.) Distinguish between analogue and digital measuring instruments. (2 marks)
- c.) What are the advantages of digital measuring instruments over the analogue instruments? (2 marks)
- d.) With the aid of suitable diagram, describe the operation of a digital oscilloscope (4 marks)
- e.) What do you understand by: i.) Vertical deflection? ii.) Horizontal deflection? (2 marks)