FACULTY: ENGINEERING

SEMESTER I EXAMINATIONS (MARCH, 2017)

2016 / 2017 ACADEMIC SESSION

COURSE CODE: EEE 311

COURSE TITLE: MEASUREMENTS AND INSTRUMENTATION

DURATION: 2Hours, 30 minutes

HOD'S SIGNATURE

INSTRUCTIONS:

1.   ANSWER ANY FIVE (5) QUESTIONS

2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.

Question 1

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

    i.)   Accuracy

    ii.)   Sensitivity

    iii.)   Range

    iv.)   Repeatability

    v.)   Reproducibility

b.) Define a real-time system and give two examples

c.) An ammeter has a f.s.d of 10mA and a resistance of 50 ohms. The ammeter is used to measure the current in a load of resistance 500 ohms when the supply voltage is 10volts. Calculate: i) the ammeter reading expected (neglecting its resistance)

    ii.) the actual current in the circuit

    iii.) the power dissipated in the ammeter and

    iv.) the power dissipated in the load?
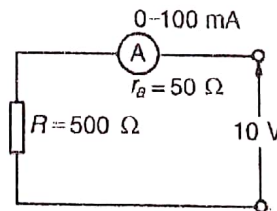
Question 2

a.) Explain briefly the following terms

    i.)   Transducers and give examples

    ii.)   Analogue to digital conversion

b.) What do you understand by instrument loading effect?

c.) Calculate the power dissipated by the voltmeter and resistor R in figure 1.1 when (i) $R = 250$ ohms (ii) $R = 2$ mega ohms. Assume that the voltmeter sensitivity (figure of merit) is 10 kilo ohmn/volt.
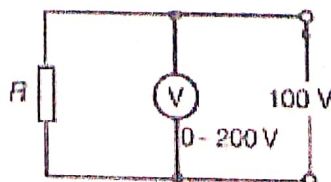
d.) Write briefly on the following instruments

    i.)   Wattmeter

    ii.)   Signal generator

Question 3

a.) What is an oscilloscope?

b.) Distinguish between analogue and digital oscilloscope.

c.) A sinusoidal voltage trace displayed by an oscilloscope is shown below. If the time on the 'time/cm' switch is on 500µs/cm. And the 'volts/cm' switch is on 5V/cm, find, for the waveform

    i.)   The frequency, ii.) the peak-to-peak voltage, iii.) the amplitude iv.) the r.m.s value
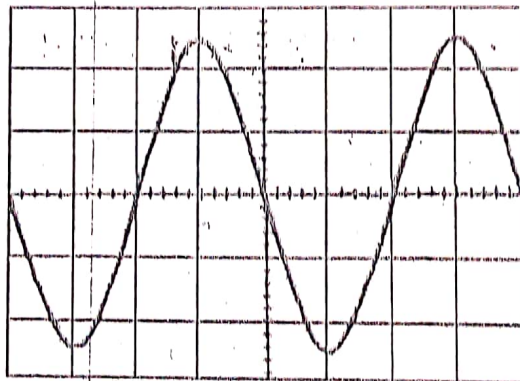
Question 4

a.) Describe briefly the concept of a SCADA system

b.) Describe three applications of instrumentation systems to everyday life

c.) Describe briefly the constituent elements of an instrumentation system

d.) A moving coil instrument having a resistance of 10 ohms gives a f.s.d. when the current is 12mA. What is the value of the multiplier that would be connected in series with the instrument so that it can be used as a voltmeter for measuring up to 120V.

Question 5

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

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

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

d.) A moving coil instrument gives a full scale deflection when the current 80mA and the resistance is 60 ohms. Calculate the value of the shunt to be connected in parallel with the metre to enable it to be used as an ammeter for measuring up to 120A. A moving-coil instrument has a f.s.d. of 20 mA and a resistance of 25Ω. Calculate the values of resistance required to enable the instrument to be used

i.) as a 0 –10 A ammeter, and (ii.) as a 0 –100 V voltmeter.

Question 6

a.) Mention five electrical/electronic measuring instruments and their uses

b.) Distinguish between analogue and digital measuring instruments.

c.) What are the advantages of digital measuring instruments over the analogue instruments

d.) With the aid of suitable diagram, describe the operation of a digital oscilloscope

e.) What do you understand by : i.) vertical deflection? II.) Horizontal deflection?