UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE	:	ELECTRONIC INSTRUMENTS AND MEASUREMENTS
COURSE CODE	:	BEF 24002
PROGRAMME	:	BEE
EXAMINATION DATE	:	JUNE 2012
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER ANY **FOUR (4)** QUESTIONS

THIS PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) In almost every field instruments are used for measurement to know, evaluate and control the quantities. Application of different type of instruments defines their respective scope.

(i) Briefly define the importance of electronic instruments.

(2 marks)

(ii) Enumerate electronic voltmeter types and compare the advantages of transistor voltmeter over vacuum tube voltmeter.

(2 marks)

(iii) List all types of static errors

(1 mark)

(b) Accuracy is the prime feature of any instrument. Every instrument works on its building blocks.

(i) List all types of static errors.

(ii) Discuss the principle of an electronic voltmeter and its types.

(iii) Draw a neat block diagram of an electronic voltmeter.

(iv) If accuracy of 500 volts voltmeter is ± 2% of its full scale deflection, then calculate the limiting error when the instrument is used to measure a voltage of 120 volts.

(8 marks)

(c) For proper measurement the readings taken by instruments should be accurate. Otherwise errors are calculated to make the measured quantities to their nearest possible actual/correct values.

If an expected current across a resistor is 13 mA and while measurement we get 12.5 mA. Calculate:

(i) The absolute error

(ii) The % of error

(iii) The relative accuracy

(iv) The % of accuracy

(12 marks)

Q2 (a) All AC bridges are based on Wheatstone bridge and are used to measure L and C.

(i) Discuss the scope of AC bridges

(2 marks)

(ii) Draw a neat circuit diagram for Schering bridge by writing its general bridge equation.

(3 marks)

(b) Spectrum analyzers are used in non real time analysis in the frequency domain.

(i) Compare Fourier analyzer superiority over spectrum analyzer. Discuss from application point of view.

(3 marks)

(ii) Define the harmonics and explain how it distorts the signal? Discuss its significance in measurement and instrumentation.

(3 marks)

(c) Transducers play an important role in all types of fields for measurement for converting non electrical quantities to electrical quantities.

(i) With the help of circuit diagram, discuss the construction and working principle of a linear variable differential transformer.

(4 marks)

An LVDT has the input of 6.3 volts, output of 5.2 volts, range of $\pm$ 0.5 in. Determine:

(ii) The output voltage versus core position for a core movement going from +0.45 to -0.03 in.

(2 marks)

(iii) The output voltage when the core is -0.25 in from center.

(1 mark)

(iv) Define temperature transducers

(2 marks)

(v) Classify temperature transducers.

(2 marks)

A platinum resistance thermometer has a resistance of 150 Ω at 20^0 C.

(vi) Calculate its resistance at 50^0 C. At 20^0 C, temperature co-efficient is 0.00392.

(3 marks)

Q3 (a) (i) With the help of neat block diagram, discuss digital multimeters.

(5 marks)

(b) (i) Explain signal tracing procedures.

(5 marks)

(c) (i) Discuss the significance of signal to noise ratio in the field of instrumentation.

(5 marks)

(ii) A signal voltage of 10 μV is amplified by a transistorized amplifier so that its output voltage is 100 μV. Superimposed on the output signal voltage is noise voltage of 15 μV which was generated in the amplifier. What is the signal-to-noise ratio of the output signal?

(5 marks)

(iii) Describe the possible mechanisms for the generation of noise found in Q3(c)(ii).

(5 marks)

Q4 (a) For any reason if there is unavailability of large range meters, small range meters can be extended for it.

With the help of a neat diagram discuss the extension of range of:

(i) A voltmeter

(3 marks)

(ii) An ammeter

(3 marks)

(b) Oscilloscope plays an important role in the field of instrumentation and measurement while applying in laboratories, research, and industry.

(i) Draw a neat block diagram of an oscilloscope.

(4 marks)

(ii) Define each major part of it.

(3 marks)

(c) Potentiometer is known as active circuit because it takes zero current from the circuit that is being measured.

The basic slide wire potentiometer has a working battery of 3 volts. The slide wire has a resistance of 300 Ω and a length of 200 cm. A 200 cm scale placed alongside the slide wire has 1 mm scale divisions and standardized against a voltage reference source of 1.019 volts, with the slider set at the 101.9 cm mark on the scale. Calculate:

(i) The working current.

(3 marks)

(ii) The resistance setting of the rheostat.

(3 marks)

(iii) The measurement range.

(3 marks)

(iv) The resolution expressed in mV.

(3 marks)

Q5 (a) In instrumentation, bridge circuits are used for making measurement comparison. These are widely used for measurement of R, L, C and Z by null indication technique.

(i) Explain Wheatstone bridge.

(2 marks)

(ii) Draw a neat circuit diagram for it.

(2 marks)

(iii) Derive its equation for unknown R.

(2 marks)

(b) (i) With the help of diagram explain Kelvin bridge.

(3 marks)

(ii) Show how it differs from Wheatstone Bridge.

(3 marks)

(c) In a Wheatstone bridge, if the opposite arms possess 12 to 15 kΩ and 32 kΩ to unknown *R*.

(i) Draw a circuit by incorporating its right values against each arm.

(4 marks)

(ii) Calculate unknown *R*.

(3 marks)

In a circuit diagram as shown in Figure 5(c),

(iii) Calculate the current through the Galvanometer by using Thevenin's equivalent circuit.

(6 marks)

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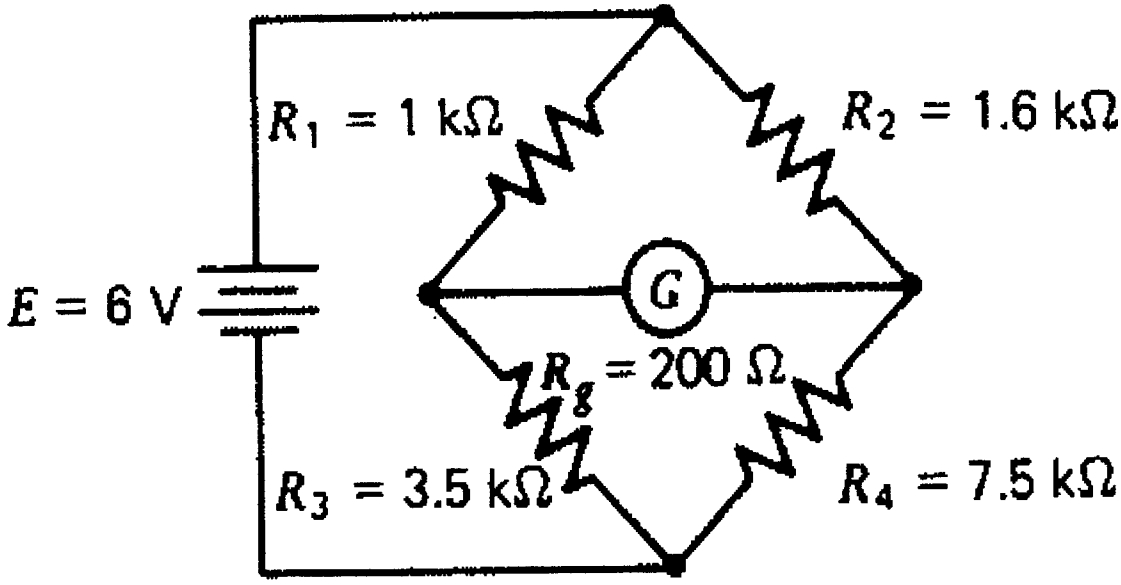

FIGURE Q5(c)