Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	ELECTRONIC INSTRUMENTS AND MEASUREMENTS
COURSE CODE	:	BEF 24002
PROGRAMME CODE	:	BEV
EXAMINATION DATE	:	DECEMBER 2018/JANUARY 2019
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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Q1 (a) (i) What is the importance of measurement in electrical system?

(3 marks)

(ii) Differentiate between analogue and digital sensors and sketch its output signals.

(6 marks)

(b) **Figure Q1(b)** shows the circuit in the basic analogue electronic ohmmeter. If the measured resistor (between x and x') is 400Ω, calculate the meter current.
(*Notes* : The meter intenal resistance is 100Ω).

(6 marks)

(c) (i) Draw the block diagram involved in the analogue to digital process.

(4 marks)

(ii) Suggest **TWO (2)** ways to increase the accuracy of analogue to digital converter (ADC).

(2 marks)

(d) **Table Q1(d)** is the mid-ordinate values of the half cycle voltage waveform. Calculate its peak to peak voltage (V_{pp}) and the average voltage (V_{av}).

(4 marks)

Q2 (a) (i) Define what is oscilloscope.

(3 marks)

(ii) Discuss **TWO (2)** functions of an oscilloscope.

(4 marks)

(b) Sketch and label the diagram of a Cathode Ray Tube (CRT).

(5 marks)

(c) List **FIVE (5)** types of signal generating instruments.

(5 marks)

(d) (i) Draw and label the circuit of a Wien bridge oscillator.

(5 marks)

(ii) Determine the frequency of oscillation for **Q2(d)(i)** if $R=6\ k\Omega$ and $C=0.003\ \mu F$.

(3 marks)

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Q3 (a) State **FOUR (4)** types of temperature transducers.

(4 marks)

(b) A resistant strain gauge with a gauge factor of 2.5 is fastened to a steel member. If the original resistance value of the gauge is 250 Ω,

(i) determine the change in resistance of the gauge if the force of the strain gauge is 1.5×10^{-6}.

(3 marks)

(ii) find the stress that given to the gauge in **Q3(b)(i)** if the Young's modulus is 1.6×10^{10} kg/m^2.

(2 marks)

(c) Sketch an inductive input transducer for measuring flow application.

(5 marks)

(d) Based on the answer given in **Q3(c),** when the magnetic field strength and the conduit diameter are given as 0.8T and 5mm respectively, determine the flow velocity of the measured material if the system produce the electromotive force of 12.5×10^{-3} V.

(3 marks)

(e) An AC LVDT has an output of ± 4.8 V for range ± 5mm.

(i) Determine the output voltage if the core displacement to 3mm.

(2 marks)

(ii) If the LVDT produces -1.6 volt, determine the core displacement.

(2 marks)

(f) **Figure Q3(f)** shows the relay which is controlled by a photoconductive cell with specific characteristic. The circuit delivers 10 mA at 12 V. The cell is illuminated to about 400 lm/m^2 and becomes deenergized when the cell is dark (1 lm/m^2).

(i) Determine the required series resistance of R_1.

(2 marks)

(ii) Determine the level of the dark current.

(2 marks)

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Q4 (a) List **THREE (3)** components in the amplifying system that generates the noise.

(3 marks)

(b) State **TWO (2)** techniques of noise suppression if the noise sources are RF generators.

(2 marks)

(c) State **TWO (2)** techniques of noise suppression if the noise sources are electric motor and power generator.

(2 marks)

(d) A voltmeter consists of three 6 KΩ input resistors. At temperature room of 290 K and bandwidth frequency of 100 kHz,

(i) determine the total noise voltage that generated in the resistors of the voltmeter if the all resistors are connected in series.

(4 marks)

(ii) determine the total noise voltage that generated in the resistors of the voltmeter if the all resistor are connected in parallel.

(4 marks)

(e) A low-pass RC filter has capacitor of 0.01 μF. At frequency of 0.5 Mhz, the filter attenuates the noise to 3%.

(i) Determine the cut-off frequency of the filter.

(3 marks)

(ii) Determine the resistor of the filter.

(3 marks)

(iii) Analyze the filter at 400-Hz input signal.

(2 marks)

(iv) Determine the attenuation of the signal.

(2 marks)

-END OF QUESTIONS-

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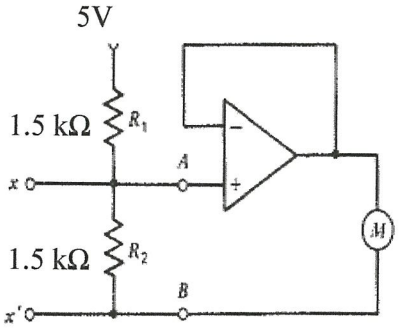

Figure Q1(b)

Table Q1(d)

Volt	6.2V	11.8V	16.2V	19.0V	20.0V	19.0V	16.2V	11.8V	6.2V	0V
Angle	18°	36°	54°	72°	90°	108°	126°	144°	162°	180°

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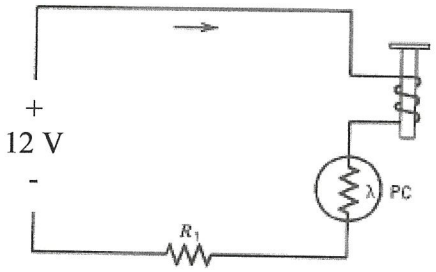
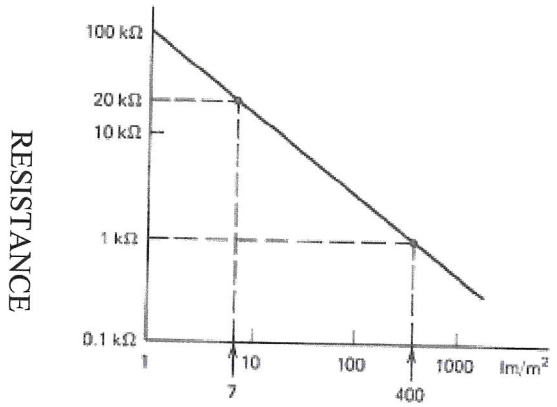


(a)



(b)

Figure Q3 (f)