Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESI 2016/2017

COURSE NAME	:	ELECTRIC INSTRUMENTATION AND MEASUREMENT
COURSE CODE	:	DAE 21402
PROGRAMME CODE	:	DAE
EXAMINATION DATE	:	JUNE 2017
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY.

THIS QUESTION PAPER CONSISTS OF **FIVE(5)** PAGES

Q1 (a) Define error.

(2 marks)

(b) Name the type of error based-on the following statement:-

(i) an error due to carelessness
(ii) an error due to environment factors
(iii) the error is expressed as a percentage

(3 marks)

(c) Briefly explain how to minimize an error.

(3 marks)

(d) Give two **(2)** reasons why there are differences between calculated and measured values.

(4 marks)

(e) Give a reason why an accuracy is very important for an automatic weapon systems in military operation/exercise.

(3 marks)

(f) State two **(2)** disadvantages if the accuracy in **Q1(e)** is poor.

(4 marks)

(g) State the relationship between accuracy, quality and cost.

(3 marks)

(h) Give two **(2)** opinions if an accuracy of a speed traps instruments is less than 80% during "Ops Raya" activity.

(3 marks)

Q2 (a) Name two **(2)** major components of Permanent Magnet Moving Coil (PMMC) instruments.

(2 marks)

(b) State the purpose of jewel-bearing suspension method in PMMC instruments.

(2 marks)

(c) Briefly explain the basic principle how to rotate the coil of PMMC instruments.

(3 marks)

(d) Briefly explain how does the controlling force works to rotate and stop the coil and pointer of PMMC instruments.

(4 marks)

(e) Draw and label accordingly the basic circuit of the DC Voltmeter.

(3 marks)

(f) From your answer in **Q2 (e)**, derive the equation to determine the value of the series resistance, R_S.

(4 marks)

(g) Draw and label clearly the basic circuit of the DC Ammeter.

(3 marks)

(h) From your answer in **Q2 (g)**, derive the equation to determine the value of the shunting resistor, R_{sh}.

(4 marks)

Q3 (a) State the purpose of the following:-

(i) Wheatstone Bridge
(ii) Maxwell Bridge

(4 marks)

(b) Draw and label accordingly the circuit of the Wheatstone Bridge.

(4 marks)

(c) From your answer in **Q3(b)**, derive the equation to find an unknown resistance if the bridge is in balance condition.

(5 marks)

(d) Draw and label accordingly the circuit of the Maxwell Bridge.

(5 marks)

(e) From your answer in **Q3 (d)**, derive the equation to find an unknown resistance and unknown inductance if the bridge is in balance condition

(7 marks)

Q4 (a) Draw four **(4)** types of fundamental waveforms.

(2 marks)

(b) State the importance of calibrating an oscilloscope.

(3 marks)

(c) Draw and label completely two **(2)** cycles of pulse waveform with 10 % duty cycle, $V_P = 10$ V and $T = 0.1$ s.

(5 marks)

(d) Draw and label completely, 1⅜ cycles of sine wave with $V_{P-P} = 20$ V and $f = 100$ Hz.

(5 marks)

(e) If the sine wave have the values of $V_{P-P} = 60$ V and $T = 100$ nS, calculate the:-

(i) peak voltage, V_P
(ii) rms voltage, V_{rms}
(iii) average voltage, V_{avg}
(iv) frequency, f

(8 marks)

(f) Give two **(2)** types of industries where an oscilloscope are commonly used.

(2 marks)

Q5 (a) State the difference between sensors and transducers.

(4 marks)

(b) Draw and label completely the basic circuit of capacitor microphone.

(4 marks)

(c) State the basic concept of the capacitor microphone.

(2 marks)

(d) Briefly explain the operating principle of the capacitor microphone.

(5 marks)

(e) Give two **(2)** examples of applications for **each** of the following sensors and transducers at home :-

(i) infrared sensor
(ii) temperature sensor
(iii) sound transducer

(6 marks)

(f) Give two **(2)** opinions why the applications of sensors is very important in modern life.

(4 marks)

Q6 (a) Define actuator.

(2 marks)

(b) State the difference between input and output transducers.

(3 marks)

(c) State the functions of the following actuators:-

(i) relays
(ii) solenoids
(iii) motors

(6 marks)

(d) Briefly explain the operating principle of the following temperature sensors:-

(i) thermocouple
(ii) thermistor

(8 marks)

(e) Give two **(2)** examples of applications for **each** type of the following temperature sensors in industrial sectors:-

(i) thermocouple
(ii) thermistor
(iii) IC sensors

(6 marks)

- END OF QUESTION -