



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER I SESSION 2010/2011

COURSE NAME : INSTRUMENTATION AND MEASUREMENT TECHNOLOGY

COURSE CODE : DET 2142

PROGRAMME : 2 DET

EXAMINATION DATE : NOVEMBER/DECEMBER 2010

DURATION : 2 HOURS

INSTRUCTIONS : ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

- Q1** (a) Define the following:-
- (i) Error
 - (ii) Accuracy
- (4 marks)
- (b) State three (3) major types of error.
- (3 marks)
- (c) State a difference between gross errors and systematic errors.
- (2 marks)
- (d) Give two (2) examples for each type of errors in Q1(c).
- (4 marks)
- (e) State a common method to minimize an error.
- (2 marks)
- (f) Given a four (4) band resistor with the colour coded:
Brown, Black, Red and Silver.
- (i) Determine the resistance value and expressed the tolerance in relative error.
 - (ii) Determine the resistance value and expressed the tolerance in absolute error.
 - (iii) Calculate an error if the value of the resistor is maximum.
 - (iv) Calculate an error if the value of the resistor is minimum.
- (10 marks)
- Q2** (a) Define Ohmmeter.
- (2 marks)
- (b) List two (2) passive, components, two (2) active components and two (2) optical components that can be tested using range R X 1 of an Analog Ohmmeter.
- (3 marks)

- (c) State two (2) major functions of the following:-
- (i) Ohmmeter
 - (ii) Voltmeter
- (4 marks)
- (d) With the aid of suitable diagrams, show how to determine the power diode is in good and bad conditions during forward-biased and reverse-biased testing by using Analog Ohmmeter.
- (10 marks)
- (e) State three (3) comparisons between analog multimeter and digital multimeter when testing silicon diode.
- (6 marks)
- Q3**
- (a) Define Ammeter.
- (2 marks)
- (b) Draw the symbols of AC and DC Ammeters.
- (1 marks)
- (c) State two (2) major functions of AC and DC Ammeters.
- (4 marks)
- (d) Draw a suitable diagram of DC circuit using supply, switch, and two (2) loads. Show the connection of an Ammeter for measuring the circuit current.
- (5 marks)
- (e) From Q3(d), briefly explain in sequence the procedure to measure DC current flow to the loads using ammeter.
- (5 marks)
- (f) State the reason why an Ammeter must be connected in series with the load for measuring the current.
- (2 marks)
- (g) Prove your answer in Q3(f) mathematically based-on the circuit in Q3(d).
- (2 marks)

- (h) State two (2) possibilities what would happen if an Ammeter is connected in parallel with the load to be measured for measuring the current.
(4 marks)
- Q4** (a) Define an Oscilloscope.
(2 marks)
- (b) State two (2) main purposes of an Oscilloscope.
(5 marks)
- (c) State the function of vertical section of an Oscilloscope.
(2 marks)
- (d) Draw $2\frac{1}{4}$ - cycles of triangle waveform. Label completely X-axis, Y-axis, V_{P-P} , V_P , $+V_P$, $-V_P$, T and 2T.
(10 marks)
- (e) State a difference between an Oscilloscope and Voltmeter in terms of AC voltage measurement.
(3 marks)
- (f) An output voltage of a transformer show $20 V_{P-P}$ if it is measured using an Oscilloscope. Determine the output voltage of transformer if it is measured using AC Voltmeter.
(3 marks)
- Q5** (a) State the purpose of Wheatstone bridge.
(2 marks)
- (b) State the function of adjustable precision resistor in Wheatstone bridge circuit.
(2 marks)
- (c) Draw and label completely the basic circuit of Wheatstone bridge.
(5 marks)

- (d) Name all the components of the circuit in Q5(c). (5 marks)
- (e) From the circuit in Q5(c), analyze the circuit mathematically to produce an equation of unknown resistance when the bridge is balance (Null condition). (5 marks)
- (f) State three (3) applications of the Wheatstone bridge in commercial circuits. (3 marks)
- (g) State a reason why there is no current flow through the Galvanometer when the bridge is balance. (3 marks)

Q6 (a) Define the following:-

- (i) Sensors
(ii) Transducers (4 marks)

- (b) List three (3) basic elements of Bar Code System. (3 marks)
- (c) From your answer in Q6(b), briefly describe their basic operation for each element. (12 marks)
- (d) State three (3) reasons why Bar Code technology is widely used in industrial, commercial and service sectors. (3 marks)
- (e) From your answer in Q6(d), give two (2) examples of application in each sector. (3 marks)