

UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION (SETA)
JANUARY 2016 SEMESTER

COURSE CODE : LED20803
COURSE NAME : INSTRUMENTATION
PROGRAMME NAME : DIPLOMA
DATE : 25 MAY 2016
TIME : 02.00PM – 05.00PM
DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections; Section A and Section B.
4. Answer **ALL** questions in Section A. For Section B, answer **THREE (3)** questions.
5. Please write your answers on the OMR answer script and answer booklet provided.
6. Answer all questions in English.

THERE ARE 10 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

Question 6 - Question 10 are based on the statement given below.

One of two dials potentiometer consists of 20 stages main dial which its value for every stages is 10Ω . For each of main dial resistor represents $0.1V$. A slide wire resistance is 10Ω and scale of division is 200. The working battery is $6V$.

6. Calculate the working current of the potentiometer.

A 10 mA	C 0.01 mA
B 10 A.	D 0.1 A

7. Compute the total resistance of the potentiometer, R_T

A 21Ω	C 200Ω
B 20Ω	D 210Ω

8. What is the measurement range, V_{max}

A 2 V	C 20 V
B 2.1 V	D 21 V

9. Calculate the rheostat voltage, $V_{rheostat}$

A 3.9 V	C 6 V
B 2.1 V	D 8.1 V

10. Determine the adjusting value of rheostat, R_{rh}

A 39Ω	C 600Ω
B 390Ω	D 210Ω

11. An analog to digital converter, ADC converts

A Analog to digital information	C AC voltage to DC voltage
B Digital to analog information	D DC voltage to AC voltage

12. The main parts of analogue electronic meter include

- I. DC amplifier
- II. Limiting switch
- III. Rectifier
- IV. Function switch

- A I,II
- B I,II,II
- C I,III,IV
- D I,II,III,IV

13. Sensor is defined as

- A A device that converts analog into digital information
- B A device that measures physical quantities and converts into signal readable by an instrument.
- C The difference between the expected value and the measured value of the variable.
- D How close a number of measurement of the same quantity agree with each other

14. Which of the following are the light sensor

- I. Light dependent resistor
- II. Photo-transistor
- III. Capacitor
- IV. Bipolar junction transistor

- A I,IV
- B II,III
- C I,II
- D III,IV

15. The advantages of thermistor are

- I. Small size
- II. Good sensitivity in negative temperature coefficient region
- III. Fast response to critical narrow temperature
- IV. Non-linearity in resistance vs temperature characteristics

- A I,IV
- C I,II,III

B II,III

D I,II,III,IV

16. The calibration of a voltmeter can be carried out by using

A a frequency meter

C an ammeter

B a potentiometer

D a function generator

17. Which of the following are common types of faults in cable.

A ground faults

C open circuit faults

B short circuit faults

D all of above

18. Wheatstone bridge is used to measure

A medium resistance

C high resistance

B low resistance

D all of above

19. A bridge is said to be balanced when the current in the galvanometer is

A maximum

C zero

B minimum

D negative

20. Localization of cable faults are done by

A short circuit test

C Varley loop Test

B Murray loop test

D Murray loop test & Varley loop test

21. Steady-state stability of a power system is the ability of the power system to

A maintain frequency at 50Hz.

B maintain synchronism between machine and on external tie lines.

C maintain voltage at fixed or rated value.

D maintain hot reserve and cold reserve all the times.

22. At the unity-gain frequency of an operational amplifier, the open loop gain is

A 1

C zero

B $A_v(\text{mid})$

D very large

23. The statements about operational amplifier are TRUE except

- A Have two input terminal and one output terminal.
- B Have high gain amplifier and able to amplify signal with frequency ranging from 0-1MHz
- C Perform mathematical operation like summation, subtraction and multiplication.
- D Example of op-amp is photo-transistor.

24. The procedure to find cable fault includes

- I. Testing which consists of continuity test and insulation test
- II. Locating cable fault test from terminal cables
- III. Confirmation fault pint test
- IV. Troubleshooting

- A I,II
- B II,III
- C I,II,IV
- D I,II,III,IV

25. Which of the following is a pressure sensor

- A photo-transistor
- B thermistor
- C thermocouple
- D strain gauge

SECTION B (TOTAL 75 MARKS)

INSTRUCTION: Answer only THREE (3) questions.

Please use the answer booklets provided.

Question1

a) No measuring instrument is completely stable and exhibit unwanted fluctuations if the sensitivity is increased to the limit. Define a measurement process and list two functions of measuring instruments.

(5 marks)

b) Table 1 shows the values taken by five students using difference digital multimeter. Analyze the values and evaluate the:

i. Most precise reading for meter A?

(5 marks)

ii. Most precise reading for meter B?

(5 marks)

iii. Standard deviation for meter A and B.

(10 marks)

Table 1

Student	Meter A (uA)	Meter B (V)
Aril	5.31	14.00
Ah Bee	5.45	14.20
Kumar	5.48	14.14
Ramesh	5.55	14.30
Kash	5.47	14.15

Question 2

a) Potentiometers are an instrument that used to measure voltage by using differentiates method with one of standard value. The measurement has made with adjusting of contactor until the zero reading has been recorded. This condition called as balance condition due to depletion voltage is same as standard voltage that provided on slide wire. List five (5) advantages of potentiometer.

(5 marks)

b) Figure 3 shows a basic circuit of a slide wire potentiometer. The basic of slide wire potentiometer had used depletion voltage concept on conductor wire which is proportional directly with long of conductor wire that used. The maximum depletion voltage on entire of conductor wire is equal to supply voltage that used. Explain in detail the principle of operation for basic slide wire potentiometer.

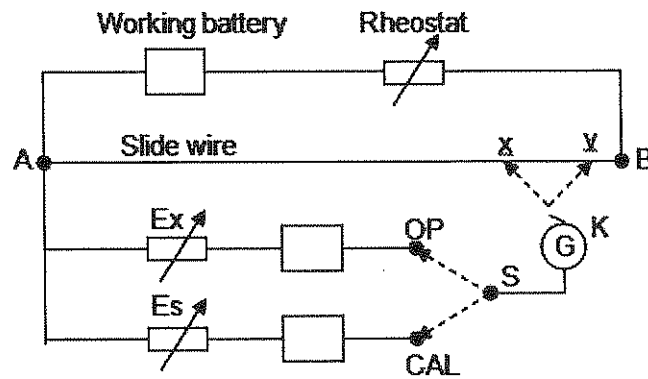


Figure 3

(10 marks)

c) A potentiometer has length of slide wire 200 cm and overall resistance value is 100 ohm. A working battery voltage is 3 volt with internal resistance is neglected. This instrument is standardized with reference voltage source 1.019 volt and contactor is set to 101.9cm during calibration process. Calculate the working current, measurement range and adjusting value of rheostat.

(6 marks)

d) The galvanometer is connected as serial connection with potentiometer. In condition that the current flowing through the standard value is bigger (happened if wrong battery polarity), it will spoil the galvanometer. Explain two (2) ways to protect the galvanometer.

(4 marks)

Question 3

a) Define sensor.

(2 marks)

b) Thermistors have a Negative Temperature Coefficient (NTC) which means resistance decreases as temperature rises. Any increase in temperature of surrounding medium will result in the decrease in the resistance of thermistor and increase in the current. Describe five (5) advantages and four (4) disadvantages of Thermistor.

(9 marks)

c) A Light Dependent Resistor (LDR) is a device which has a resistance which varies according to the amount of light falling on its surface. Typical devices are made from semiconductors such as cadmium sulphide (CdS) which have a much lower resistance when illuminated. Usually resistance decreases as illumination increases, as the nature of the material is altered by the presence of light. List two (2) applications and one (1) disadvantage of LDR.

(4 marks)

d) Ultrasonic sensors are commonly used for a wide variety of noncontact presence, proximity, or distance measuring applications. Referring to Figure 2, explain the basic operation of an ultrasonic sensor.

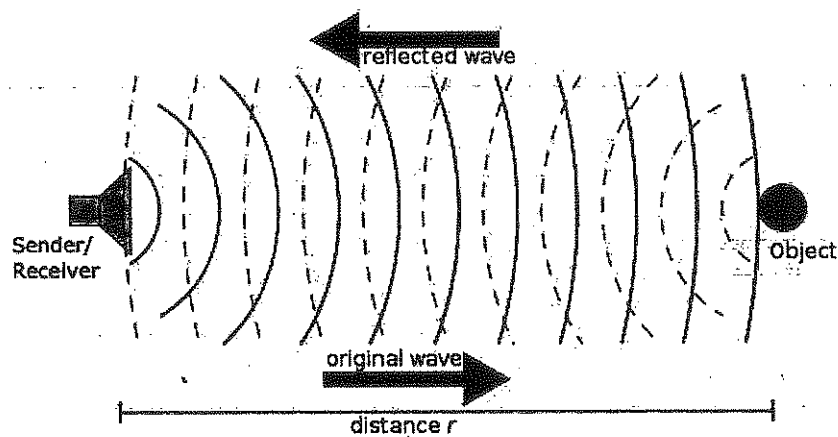


Figure 2

(10 marks)

a) State the type of bridge shown in Figure 3 and list three (3) advantages of Wheatstone Bridge. (5 marks)

b) Figure 3 show the schematic diagram of an unbalanced Wheatstone bridge. Analyze the schematic diagram, then:

i. Calculate the output voltage across points C and D

(5 marks)

ii. For a balanced Wheatstone bridge, prove that $R_4 = R_3 \frac{R_2}{R_1}$ and evaluate the value of resistor R4 required to balance the bridge circuit.

(15 marks)

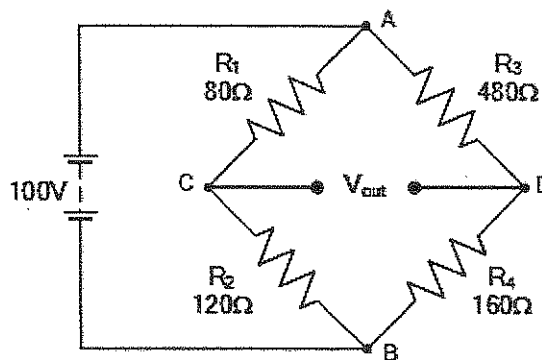


Figure 3

END OF EXAMINATION PAPER

