



CRAWFORD UNIVERSITY

FAITH CITY, IGBESA, OGUN STATE

COLLEGE OF NATURAL AND APPLIED SCIENCES

B.Sc. EXAMINATION RAIN SEMESSTER 2022/2023 SESSION

ICT414: MEASUREMENT AND INSTRUMENTATION

TIME ALLOWED: 2 HOURS

INSTRUCTIONS: ANSWER 4 QUESTIONS ONLY

1(a) Define instrumentation (2mks)

Mention any 3 areas of application. (3 mks)

(b) Explain your understanding of the following (3 mks)

- i. Transducer
- ii. Sensor
- iii. Actuator

(c) State 4 reasons why most transducers are electrical rather than pneumatic. (4 mks)

(d) Mention any 2 sensors that can convert temperature change to electrical signal. Which one of them is suitable for measuring the temperature of a furnace? (3 mks)

2(a) Mention any 4 base units of measurement you know. In a tabular form, state the unit name, unit symbol and the physical quantity it measures. (8 mks)

(b) To express two nano Farad (nF) in standard form, we say $2\text{nF} = 2.0 \times 10^{-9}\text{F}$

Express the following in standard form using the example above: (7 mks)

(i) 148 KN (ii) 632 pF (iii) 837 μC (iv) 774 MW (v) 32 KJ (vi) 30,000 KM (vii) 662 μA (viii) 0.24 mV (ix) 132 KV (x) 575 nM (xi) 45 mg (xii) 34 MHz (xiii) 0.26 mS (xiv) 7188 Kg

3 (a) Define the following terms as they relate to measurement and instrumentation. (5 mks)

- (i) error (ii) accuracy (iii) precision (iv) sensitivity (v) resolution

3(b) State the relationship between force and (i) acceleration (ii) pressure (2 mks)

(c) What do you understand by the words (i) Shock (ii) Vibration as they apply to physical systems? Mention 3 properties of piezoelectric sensors in each case that make them ideally suited for measuring these parameters. (8 mks)

4(a) what electrical quantity (voltage, current, resistance) does a moving coil galvanometer measure? (1 mk).

(b) A galvanometer in the ICT Lab has a full scale deflection of $50\mu\text{A}$ and a coil resistance of 50Ω .

- i. Draw a circuit diagram showing the galvanometer in series with a resistor R_s that turns it into a voltmeter. (2mks)
- ii. Calculate the value of R_s if a full scale deflection of 10V is desired in i above. (2mks)
- iii. Draw a circuit diagram showing the galvanometer in parallel with resistor R_p that turns it into an ammeter. (2mks)

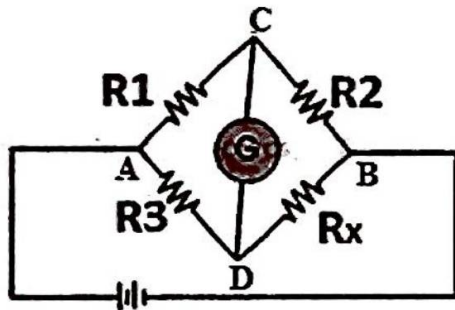
iv. Calculate the value of R_p if a full scale deflection of 5mA is desired in iii above. (2mks)

(c) State any 4 advantages of digital voltmeter that has made it the first choice for electrical measurements. (6 mks)

5(a) state the meaning of the following terms used In connection with display devices: LCD, CRT, LED (3 mks)

(b) mention 5 advantages of LCD over other display options. (5 mks)

(c) The circuit below is that of a Wheatstone bridge used in an electrical measurement. Mention the electrical quantity it measures. (1 mk)



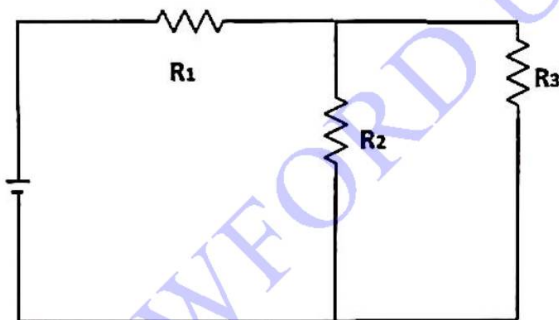
When the galvanometer indicates balance, no current flows from C to D. derive an expression for R_x in terms of R_1 , R_2 , R_3 . (6 mks)

(c) What electrical quantity (voltage, current, power or resistance) does the galvanometer measure directly? (1 mk)

(c) State any 5 advantages of digital voltmeter that has made it the first choice for electrical measurements. (5 mks)

(d) Mention 3 differences between the operation of analogue meters and digital meters used in electrical measurements. (3 mks)

6(a) Copy the diagram below and show how to connect a voltmeter that measures the voltage across R_1 . Copy it the second time and show how to measure the current through R_2 . (4 mks)



(b)For each of the following units, state if it is a base unit or a derived unit of measurement. (7 mks)

(i) Ohm (ii) Volt (iii) Ampere (iv) Coulomb (v) Farad (vi) Hertz (vii) Second

(c) Define calibration and state any 3 occasions where calibration is necessary (4 mks)

END