



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Electrical and Electronics

UNIVERSITY EXAMINATION FOR:

Diploma in Instrumentation and Control Engineering (DICE 3)

EC1 2201 MEASUREMENT TECHNOLOGY 1

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass, scientific calculator, student ID and no mobile phones.

This paper consists of five questions. Attempt **any THREE** questions

Do not write on the question paper.

Question ONE

- (a) (i) State the two basic requirement necessary to obtain results in measurement
(ii) Explain the two methods of measurement (5mks)
- (b) (i) Distinguish between the terminologies errors and accuracy
(ii) State at least four categories of most apparent effects at high frequencies of errors due to strays and residuals (6mks)

(c) (i) Define relative errors in measurement

(ii) A voltmeter having a sensitivity of $1000 \Omega/V$ reads 100V on its 150V scale. When connected across an unknown resistor in series with a milliammeter. When the milliammeter read 5mA. Calculate

- (i) Apparent resistance of the unknown resistor
- (ii) Actual resistance of the unknown resistor and
- (iii) errors due to the loading effect of voltmeter (9mks)

Question TWO

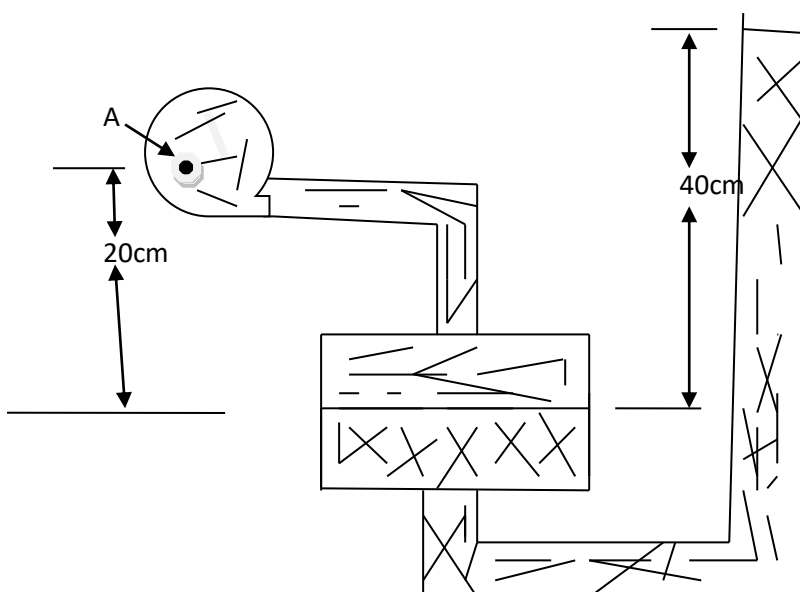
(a) Define the following devices

- (i) Manometer
- (ii) Mechanical gauge (2mks)

(b) (i) State the four common used mechanical pressure gauges

- (iii) With aid of diagram describe the U-tube manometer and show generally the differences for gauge pressure and vacuum pressure measurement (12mks)

(c) A single column manometer is connected to a pipe containing a liquid of sp. gr. 0.9 (fig below). Find the pressure in the pipe if the area of the reservoirs is 100times the area of the tube for the manometer reading (sp.gr. of mercury is 13.6)



(6mks)

Question THREE

- (a) With aids of simple diagram , explain the optical dipstick as applied in level measurement (5mks)
- (b) (i) Describe the operating principle of ultrasonic level sensor
- (ii) Enumerate at least five advantages and four disadvantages of ultrasonic level sensor (15mks)

Question FOUR

- (a) (i) State the generally used conversion of measurement of pressure using electrical transducer as secondary transducer and
- (ii) Mention at least four most commonly used summing devices responsible for the secondary transducer output (6mks)
- (b) (i) With aid of a diagram explain the resistive transducer
- (ii) A hydraulic press has a ramp of 30cm diameter and a plunger of 4.5cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500N (14mks)

Question FIVE

- (a) (i) State where pneumatic level sensors are used
- (ii) With aid of a diagram explain the closed tank level measurement with a Dp transmitter (7mks)
- (b) (i) Give a detailed account on zero elevation calibration in level measurement using diagram- illustrations and examples
- (ii) Describe briefly the inverted tube differential manometer (13mks)