(University of Choice)
MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)

MAIN CAMPUS
UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER

MAIN EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY EDUCATION IN ELECTRICAL AND
ELECTRONIC ENGINEERING

COURSE CODE: TEE 221

COURSE TITLE: ELECTRICAL MEASUREMENTS

DATE: WEDNESDAY, APRIL 27TH, 2022.   **TIME: 12:00 – 2:00 PM**

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Answer Any Other TWO (2) questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

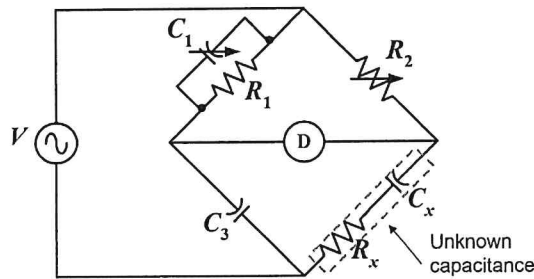This Paper Consists of 4 Printed Pages. Please Turn Over.

Figure 1

(b) In the circuit of Figure 2 (a), a multimeter of sensitivity $5k\Omega/V$ and (6mks) range $0-10V$ is used to measure voltage across $10k\Omega$ resistance as shown in Figure 2(b). Determine:

    i) the measured voltage reading.

    ii) If second multimeter of sensitivity $25k\Omega/V$ is used, determine the voltage reading and comment on the results for both cases.
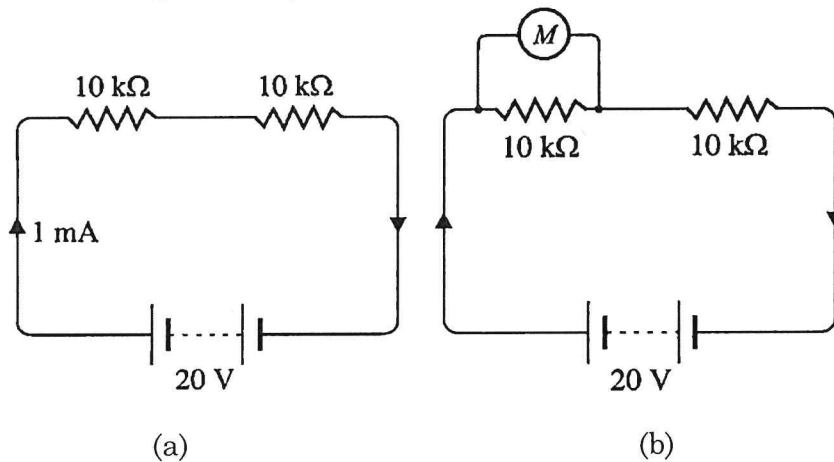

(a)   (b)

Figure 2

(c) i) State the operating principle of a strain gauge transducer. (6mks)

    ii) A steel bar of width 2cm and thickness 1cm, and Young's modulus of $2 \times 10^8 kN/m^2$, is subjected to a tensile axial load of $20kN$. A strain gauge of gauge factor 2 and resistance 120Ω is bonded longitudinally on the bar. Determine the percentage change in resistance of the strain gauge.

(d) State two benefits of using digital storage oscilloscope over the (2mks) analogue storage oscilloscope

Question Three (20mks)

(a) With the aid of a well labelled circuit diagram, describe how a (6mks) potentiometer transducer can be used with a bellows to measure changes in pressure levels.

(b) An iron–constantan thermocouple is to be used to measure (4mks) temperatures between 0 and 400°C. If the e.m.f. at $150°C =$ $7.268\,mV$; e.m.f. at $400°C = 21.846\,mV$, determine the non-linearity error as a percentage of the full-scale reading at 150°C if a linear relationship is assumed between e.m.f. and temperature over the