



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY

MECHANICAL & AUTOMOTIVE ENGINEERING DEPARTMENT

## UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG2305: WORKSHOP PROCESSES AND PRACTICE IV PP1

END OF SEMESTER EXAMINATION

**SERIES: AUGUST 2017(SCHOOL BASED)**

**TIME: 2 HOURS**

**DATE: JULY 2017**

### Instructions to Candidates

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

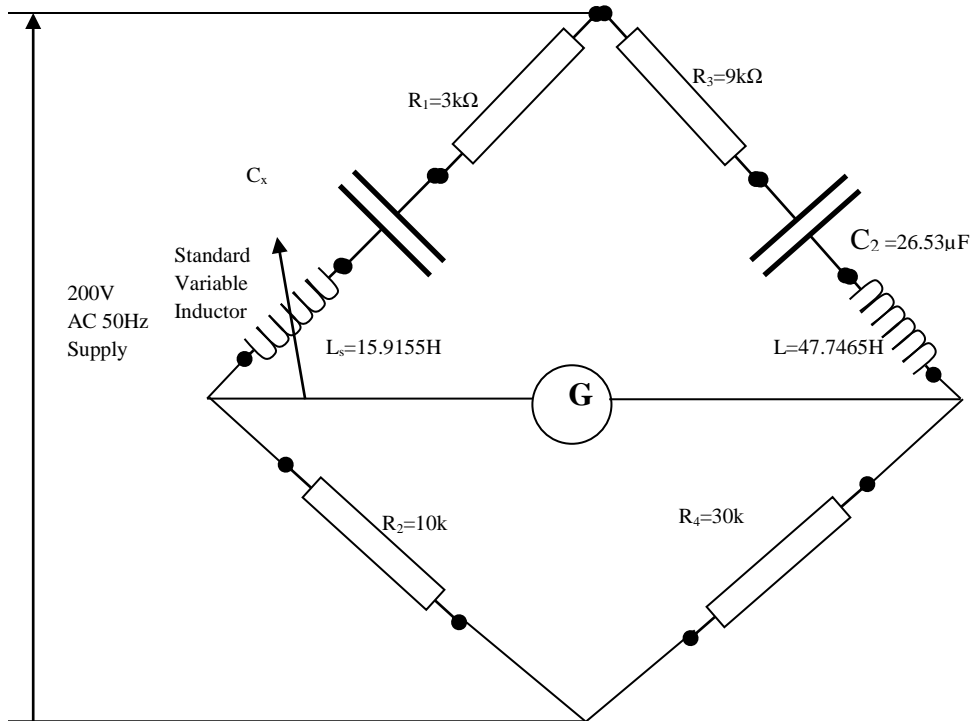
This paper consists of **five** Questions; Question ONE is compulsory. In addition attempt any Other TWO Questions.

**Do not write on the question paper.**

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### Question ONE (Compulsory 30 marks)

- a)
- Identify the FOUR key Parts of an electrical plan
  - List examples of electrical devices in each part above
- (8 Marks)**
- b)
- Explain any FOUR good features of Conduit Wiring systems over cable tray systems
  - State any FOUR properties of PVC material when used for electrical insulation
- (8 Marks)**
- c)
- State THREE conditions required for balance in AC Bridges
  - The AC Bridge Fig Q1 Below was used for Measurement



**Fig Q1**

Determine the value of capacitor  $C_x$  given that it is at null condition.

**(7 Marks)**

d)

- i. Distinguish between Clamp Type and compression type connectors used in electrical jointing
- ii. Explain THREE advantages of pressure connections in electrical jointing
- iii. Highlight the any THREE factors considered while selecting nuts, bolts, flat washers and lock washers used for electrical connectors

**(7 Marks)**

## Question TWO

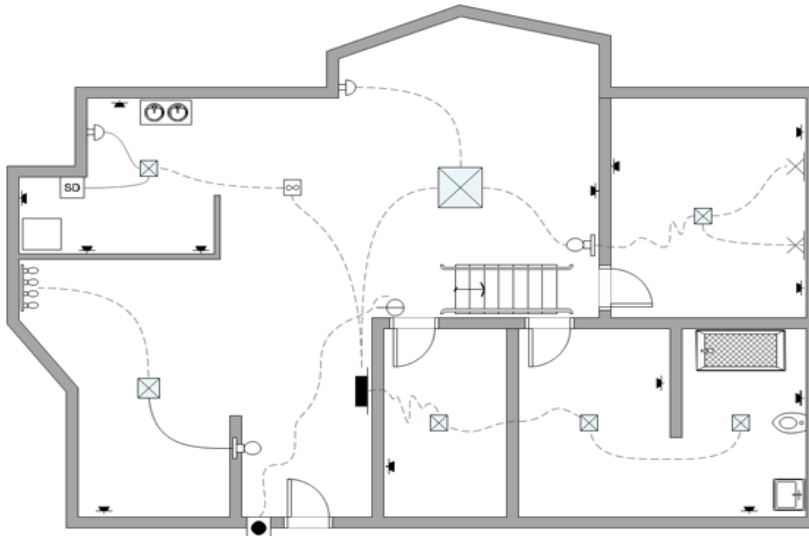
- a)
- State the reasons why starting currents for induction machines is high
  - Explain THREE problems caused by high currents taken in by induction machines during starting
- (5 Marks)
- b)
- Sketch the per phase equivalent circuit of an Induction Machine
  - Given that starting current is 6 times the running current , estimate the starting and running currents given the following stator and rotor parameters of a 3 –phase, 415V, 50Hz Induction Motor operating with 5% slip:  
 $R_s=3.5\Omega$ ,  $L_s=12.732\text{mH}$   
 $R_r'=0.3\Omega$ ,  $L_r'=9.55\text{mH}$
- (8 Marks)
- c) Sketch power and control circuit of a Direct on Line(DOL) three phase starter system and explain how it functions
- (8 Marks)

## Question THREE

- a)
- Explain the following terms Reliability, Accuracy, Precision pertaining to measurement instruments
  - State TWO advantages and TWO disadvantages of analogue instruments over digital counterparts
- (7 Marks)
- b)
- Sketch a Dynamic Coil instrument for measurement of electrical power and label important features
  - The instrument above was connected across a fixed 240V supply. A current of 10A produced a deflection of 0.3rad on the power scale. Calculate the deflection produced when the instrument was used on a fixed 48V supply with a current of 50A flowing.
- (7 Marks)
- c) A 5V, 1A Moving coil sensor was used to measure high voltage and current. Calculate the value of shunt and series resistances required for measurement of 100A and 500V respectively. Sketch the corresponding measurement circuits.
- (6 Marks)

## Question FOUR

- a)
- List the workshop tools and materials required before commencing soldering of electrical nature
  - Describe the soldering Procedure for joining two copper conductors
- (10 Marks)
- b) Read the electrical plan Fig Q4 below and answer questions that follow:



**Fig Q4**

- Describe the structural layout of premise
- State the likely use of the premise
- Describe the electrical plan and parts
- State other parts of electrical system missing from the plan
- Explain the problem in the drawing standard used

(10 Marks)

## Question FIVE

- a)
- Describe the functions of various parts of an armored cable
  - Sketch the circuit arrangement for main and final circuits in a large installation
- (7Marks)
- b) A Boiler system rated at 240 V, 3 kW is to be installed using twin with protective conductor p.v.c. insulated and sheathed cable. The circuit will be run for 140 m length. Taking the Grouping, Thermal Insulation, Grouping and Ambient temperature correction factors of 0.52, 0.89 and 0.71 respectively: refer to the table below to:
- Select through calculations the cross-sectional area of the required

- ii. Calculate the Terminal Voltage for the boiler and state if acceptable
- iii. In not acceptable find alternative solution to the problem
- iv. Sketch the circuit for the above from the distribution board
  
- v. List all terminal accessories required for the installation

CSA	Cable Rating(A)	Volt drop(V/A/m)
1.5 mm <sup>2</sup>	10A	35mV/A/m
2.5mm <sup>2</sup>	15A	25mV/A/m
4.0mm <sup>2</sup>	30A	18mV/A/m
6.0mm <sup>2</sup>	60A	10mV/A/m
10.0mm <sup>2</sup>	100A	5mV/A/m

**Table Q4**

(13 Marks)