TECHNICAL UNIVERSITY OF MOMBASA

FACUULTY OF ENGINEERING AND TECHNOLOGY

ELECTRICAL ENGINEERING DEPARTRMENT

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG2305: WORKSHOP PROCESS AND PRACTICE IV

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

DATE: Pick DateSelect MonthPick Year

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.

Question ONE (Compulsory 30 marks)

a)

i. List the THREE important tools required when bending Galvanized Steel (GS) Conduits

ii. Explain the precautions taken while bending a GS conduit

iii. List common accessories required for fitting GS conduits

(9 Marks)

b)

i. Explain the significance Maximum Demand, Diversity and Applied Diversity factors, determination of electrical installation circuits.

ii. Sketch the circuit arrangement from intake to final circuits for a large industrial installation singly metered.

(8 Marks)

c) A heater system is rated at 240 V, 6 kW and is to be installed. The circuit will be fed from a 30 A miniature circuit breaker type, and the cable will be run for 20m length. Taking the Grouping, Thermal Insulation and Ambient temperature correction factors of 0.92, 0.89 and 0.71 respectively, given that cross-sectional area and cable ratings are as shown in Table 1 below:

Cable Size(mm^2)	Rating(A)	Volt Drop(mV/A/m)
10	60	25
16	90	13
32	100	7

Table 1

i. Select through calculations and the table above the required cable size
ii. Calculate the terminal voltage for the boiler and state if acceptable
iii. Sketch and label the circuit for the above system from the distribution board intake
iv. List all circuit terminal accessories required for the installation

(13 Marks)

Question TWO

a)

State any:

i. FOUR advantages of trunk wiring systems over conduit systems
ii. FOUR advantages of PVC insulation for cables

(8 Marks)

b) Sketch a 4 cored steel wire armored cable and explain the function of THREE major parts

(5 Marks)

c)

i. Explain the procedure of connecting a cathode ray tube for frequency measurement

ii. The AC Bridge Fig 1 Below was used for frequency measurement.

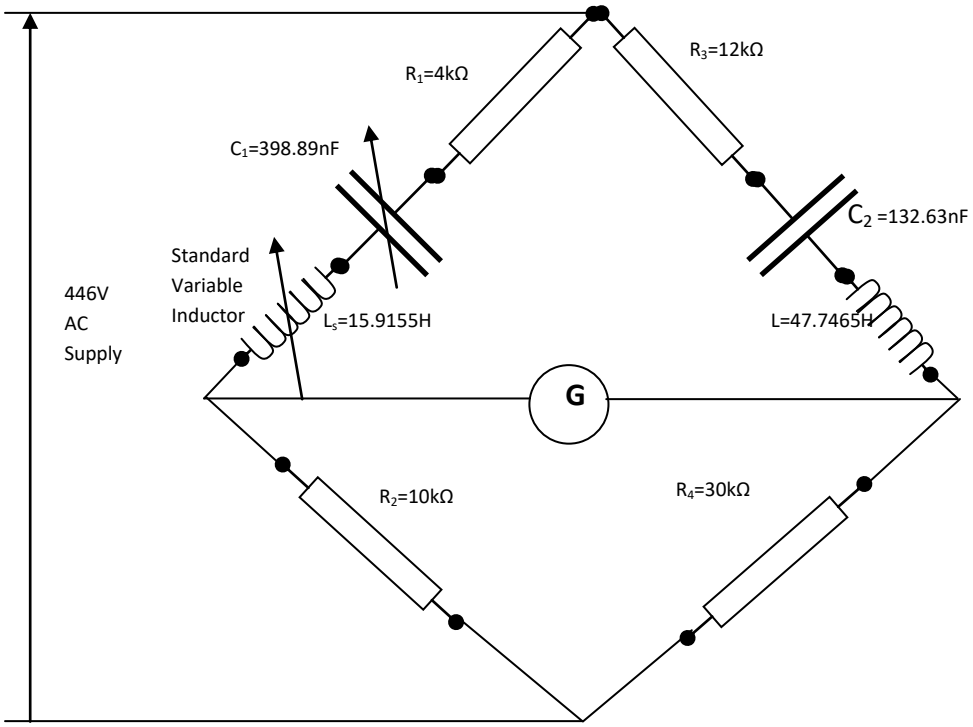

Fig 1

Given that a current of 10A is flowing in the high impedance limp, determine the frequency of supply if the standard inductor showed 15.9155H on the scale

(7 Marks)

Question THREE

a)

i. State the reason why it is not advisable to supply induction machines directly from the mains

ii. Explain THREE consequences of high currents taken in by induction machines during starting

(4 Marks)

b)

i. Sketch the per phase equivalent circuit of an Induction Machine and label

ii. Given that the starting current are 10 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=3.5Ω, L_s=12.732mH

R_r'=0.3Ω, L_r'=9.55mH

(6 Marks)

c) Sketch power and control circuit of a Forward and Reverse Star-Delta starter system and explain how it functions

(10 Marks)

Question FOUR

a)

i. Explain any THREE precautions taken while measuring high voltages in a workshop

ii. Explain the terms reliability, accuracy and precision pertaining to measurement instruments

(6 Marks)

b) Sketch and explain function of major parts of a dynamic coil instrument used for measurement of electrical power

(4 Marks)

c) Two separate 5V, 1A Moving coil sensors were used for measurement of high voltage high current and high power respectively.

i. Sketch the corresponding circuit arrangement

ii. Calculate the value of shunt and series resistances respectively required for measurement of 100A and 500V respectively.

iii. Estimate the angular pointer deflections observed for 3.5V and 0.75A sensor currents respectively given the maximum deflection of 180^{o} where a pointer scale output is in place

iv. Determine the digital output corresponding to sensor values of 3.33V and 0.6A for voltage, current and power measurement respectively, given that 8 bit Analogue to digital converters were used instead.

(10 Marks)

Question FIVE

a)

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 connectors

(7 Marks)

b) List the workshop tools and materials required before commencing soldering of electrical nature

c) Describe the soldering Procedure for joining two copper conductors

(7 Marks)

d) Read the electrical layout plan Figure 1 below and answer the questions that follow:

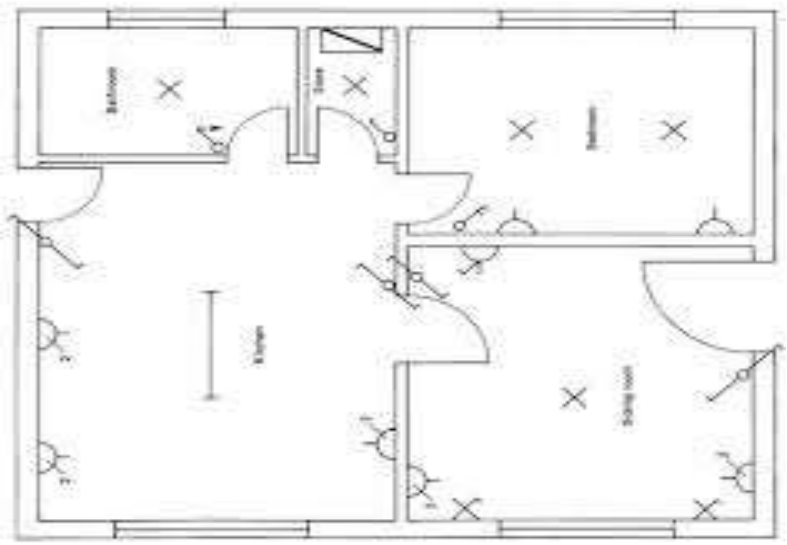

Figure 1

i. Suggest the likely use of the plan
ii. Identify the parts of electrical system included in the plan
iii. Highlight factors considered while positioning the switches
iv. Describe the types of switches proposed in the plan

(6 Marks)