Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	ELECTRICAL MEASURMENTS
COURSE CODE	:	BEF 23903
PROGRAMME CODE	:	BEV
EXAMINATION DATE	:	DECEMBER 2017/JANUARY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF FIVE **(5)** PAGES

Q1 (a) (i) Briefly explain an AC bridge and include its general figure.

(6 Marks)

(ii) Discuss **two (2)** balanced conditions of AC bridges.

(2 Marks)

(b) Find the equivalent parallel resistance (R_3) and capacitance (C_3) as shown in **Figure Q1(b)** that causes a Wien bridge to null with the following component values;
R_1=27 kΩ, C_1=5 μF, R_2=22 kΩ, R_4=100 kΩ, f=2.2 kHz

(12 Marks)

Q2 (a) Explain the **two (2)** advantages of instrument transformers.

(2 Marks)

(b) Draw and label the equivalent circuit of a current transformer.

(6 Marks)

(c) Consider a CT of 1000/5 A with turns ratio of 1/240 turns is connected to a line of 50 Hz. If the non inductive load connected to a secondary of CT is 1.5 Ω and iron loss in the core is 1.5 Watt, calculate:

(i) The actual turns ratio.

(2 Marks)

(ii) The secondary voltage.

(2 Marks)

(iii) The maximum flux in the core.

(2 Marks)

(iv) The flux density in the core.

(2 Marks)

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(v) The magnetizing current.

(2 Marks)

(vi) The phase angle.

(2 Marks)

(**Note**: By neglecting the effects of magnetic leakage and iron losses, the magnetomotive force and cross-section of the core are 96 AT and 1200 mm^2 respectively.)

Q3 (a) (i) Discuss the significance of a potential or voltage transformer (PT or VT).

(2 Marks)

(ii) Draw a circuit showing PT connected to the high voltage supply line and a low range voltmeter.

(3 Marks)

(iii) Demonstrate its construction and working principle.

(3 Marks)

(b) (i) Construct a circuit diagram for a capacitive voltage transformer (CVT).

(4 Marks)

(ii) Differentiate between CVT and RCVT in terms of their output voltage.

(2 Marks)

(iii) Point out **three (3)** advantages of RCVT.

(6 Marks)

Q4 (a) List the methods used for measuring power in single phase and three phase AC circuit.

(5 Marks)

(b) Compare the features of dynamometer wattmeter and induction wattmeter.

(8 Marks)

(c) (i) Select **one (1)** method that can be used for measuring the power in AC single phase circuit if a wattmeter is unavailable. Show the circuit diagram.

(4 Marks)

(ii) While performing a load test on a 3-phase wound-rotor induction motor by two-wattmeter method, the reading obtained on the two meters were +14.2 kW and -6.1 kW. The line voltage was 440 V. Solve for the true power drawn by the motor and the power factor.

(3 Marks)

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Q5 (a) Define what is low resistance, medium resistance, and high resistance in terms of their value. Give examples.

(6 Marks)

(b) Construct a Kelvin bridge circuit diagram and identify its limitations.

(5 Marks)

(c) The insulation resistance of a metal-sheath electrical cable shown in **Figure Q5(c)** is tested using 20 kV supply and a micro ammeter. A current of 4.5 μA is measured when the components are connected without guard wire. When the circuit is connected with a guard wire, the current is 1.2 μA.

(i) Explain the important of guard wire.

(2 Marks)

(ii) Calculate the volume resistance of the cable insulation and the surface leakage resistance.

(7 Marks)

- END OF QUESTIONS -

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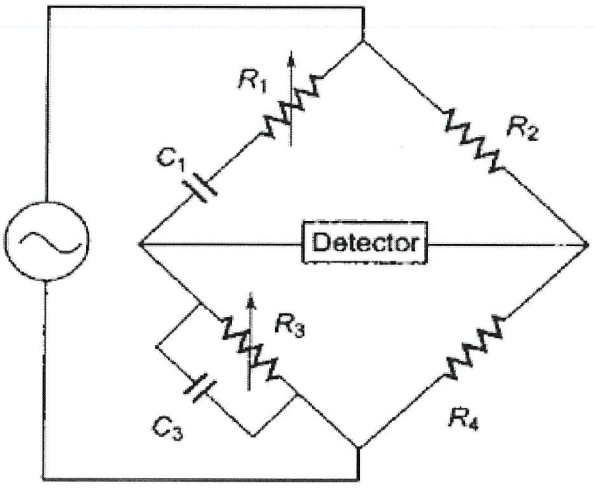

Figure Q1(b)

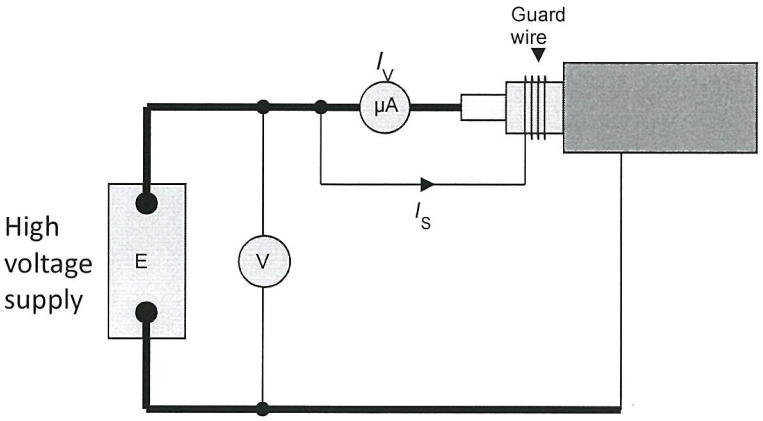

Figure Q5(c)

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