R13

Code No: 126AH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2017

ELECTRICAL AND ELECTRONICS INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) List different types of static errors of a measuring instrument [2]
b) Calculate the value of the multiplier resistance on the 100 V range of a DC voltmeter that uses a 100 mA meter movement with an internal resistance of 100Ω. [3]
c) What do you mean by standardization? [2]
d) What is a potentiometer and mention applications of it? [3]
e) Justify: "Dynamometer type instrument is used as a wattmeter" [2]
f) Why lag adjustment is provided in induction type single phase energy meter? [3]
g) Define dissipation factor? [2]
h) Explain the concept of the loss of charge method used in measuring insulation resistance. [3]
i) Explain how to use a bonded resistance wire strain gauge. [2]
j) List the factors to be considered while selecting a transducer for a given application. [3]

PART - B

(50 Marks)

2.a) Develop the torque equation for a MI instrument and mention few applications.
b) A moving coil instrument having internal resistance of 50 Ω indicates full scale deflection with a current of 10 mA. How can it be made to work as (i) a voltmeter to read 100 V on full scale (ii) an ammeter of 1 A, on full scale? [5+5]

OR

3.a) Derive the equations for force and torque of an electrostatic instruments.
b) Why is damping required for an electromechanical measuring instrument? Explain various damping systems. [5+5]

4.a) Draw the circuit diagram of a basic slide wire D.C. potentiometer. Explain its working?
b) A slide wire potentiometer of 150 cm in length has a resistance of 150 Ω, the working battery has an e.m.f of 4.2 volts and negligible internal resistance. The galvanometer resistance is 20 Ω. The standard cell has an e.m.f of 1.018V and internal resistance of 1.5 Ω. The rheostat in the circuit is adjusted so that the standard cell is in balance with the slide wire contact set at 101.8cm. Find the resistance of the rheostat? [5+5]

OR

5.a) Derive expression for actual transformation ratio, ratio error and phasor angle error of a P.T.

b) A current transformer with bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are 1.5Ω and 1.0 Ω respectively, including the transformer winding. With 5A flowing in the secondary winding, the magnetizing mmf is 100AT and the core loss is 1.2 W. Determine the ratio and phase angle errors [5+5]

6.a) With the help of neat sketch explain the construction of a single phase induction type energy meter and its principle of operation.

b) An energy meter is designed to make 100 revolutions of the disc for one unit of energy. Calculate the number of revolutions made by it when connected to a load carrying 20A at 230volts at 0.8 pf for an hour. If it actually makes 360 revolutions, find the percentage error. [5+5]

OR

7.a) With help of neat sketch, explain about a reactive power measurement using single wattmeter. Also draw the phasor diagram.

b) If the current in a pressure coil of a wattmeter lags 20^0 behind the voltage, and the instrument is accurate when cos Ø = 1, find the percentage error when cos Ø = 0.8. [5+5]

8.a) Derive the balance conditions of Wheatstone's bridge. State its limitations.

b) Explain the substitute method of measurement of medium resistance. [5+5]

OR

9.a) Draw the Maxwell's Inductance Bridge circuit. Also draw it's phasor diagram and derive expression for unknown inductance.

b) How Schering Bridge is used for the measurement of unknown capacitor. [5+5]

10.a) What is Piezo electric transducer? Explain its operation.

b) Explain the working of i) Photovoltaic cells ii) Thermistors. [5+5]

OR

11.a) With a block diagram, explain the working of CRO.

b) Explain the method of measuring displacement using LVDT with a suitable diagram and State the advantages and disadvantages of LVDT. [5+5]

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