

--	--	--	--	--	--	--	--	--	--



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Supplementary) - July, 2018

**Regulation: IARE – R16**

## ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

**Time: 3 Hours**

**(EEE)**

**Max Marks: 70**

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

### UNIT – I

1. (a) With a neat diagram explain the general constructional features of a permanent magnet moving coil instrument. [7M]
- (b) Explain the role of capacitance potential dividers in extending the range of an electrostatic voltmeter. [7M]
2. (a) Considering the energy relations for a small increment in the current supplied to the instrument, derive the expression for the torque of a moving iron instrument. [7M]
- (b) Explain the difference between limiting errors and known errors by citing suitable examples. [7M]

### UNIT – II

3. (a) What is meant by standardization of a potentiometer? With a diagrammatic representation of a basic potentiometer circuit, briefly discuss the constructional details of potentiometers, [7M]
- (b) A current transformer with a bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are  $1.5\Omega$  and  $1.0\Omega$  respectively including the transformer winding. With 5A flowing in the secondary winding, the magnetizing mmf is 100A and the iron loss is 1.2W. Determine the ratio and phase angle errors. [7M]
4. (a) List out the modifications done in design of potential transformers which lead to smaller total errors. Briefly explain them. [7M]
- (b) Calculate the inductance of a coil from the following measurement on an A.C potentiometer. Voltage drop across a  $0.1\Omega$  standard resistor connected in series with the coil =  $0.613\angle 12^{\circ}6'$ . Voltage across the test coil through a 100/1 volt-ratio box =  $0.781\angle 50^{\circ}48'$  V. Frequency is 50Hz. [7M]

### UNIT – III

5. (a) Briefly explain the special features incorporated in an electro-dynamometer type of wattmeter so that it can be used for low power factor applications. [7M]
- (b) The meter constant of a 230V, 10A watt-hour meter is 1800 revolutions per kWh. The meter is tested at half load and rated voltage and unity power factor. The meter is found to make 80 revolutions in 138s. Determine the meter error at half load. [7M]

6. (a) Explain the sources of errors in single phase induction type energy meter. [7M]  
(b) A wattmeter has a current coil of  $0.03 \Omega$  resistance and a pressure coil of  $6000 \Omega$  resistance. Calculate the percentage error if the wattmeter is so connected that:  
i. The current coil is on the load side.  
ii. The pressure coil is on the load side.  
If the load takes 20A at a voltage of 220V and 0.6 power factor in each case, what load current would give equal errors with the two connections? [7M]

#### UNIT – IV

7. (a) Classify the resistances from the point of view of measurements. Describe in brief the ammeter-voltmeter method of measurement of medium resistance. [7M]  
(b) Draw the circuit of a Wheatstone bridge and derive the conditions of balance. [7M]
8. (a) What are incremental inductance and permeability? Describe in brief as how are they measured with Owen's bridge. [7M]  
(b) Briefly explain how Wien's bridge can be used for experimental determination of frequency. Derive the expression for frequency in terms of bridge parameters. [7M]

#### UNIT – V

9. (a) Draw the block diagram of a general purpose CRO and explain the functions of the following controls. [7M]  
i. Intensity  
ii. Focus  
iii. Horizontal and Vertical positioning  
iv. Synchronization.  
(b) An electrically deflected CRT has a final anode voltage of 2000V and parallel deflecting plates 1.5cm long and 5mm apart. If the screen is 50cm from the centre of deflecting plates, Find  
i. Beam speed [7M]  
ii. The deflection sensitivity of the tube.
10. (a) Explain the construction and principle of working of a linear voltage differential transformer. [7M]  
(b) Explain the different principles of working of capacitive transducers. [7M]

