Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
PEL3I104

3rd Semester Regular/Back Examination 2018-19
ELECTRICAL AND ELECTRONICS MEASUREMENT
BRANCH : EEE
Time : 3 Hours
Max Marks : 100
Q.CODE : E793

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Distinguish between fundamental and derived units.

b) Differentiate between measurement and measured.

c) Explain about different types of drift.

d) In calculating voltage drop, a current of 4.37 A is recorded in a resistance of 31.27 ohm. Calculate the voltage drop across the resistor to the appropriate number of significant figures

e) Define standard.What are the different types of standard?

f) Distinguish between sensitivity & dead zone.

g) Mention two applications of Wien Bridge.

h) Classify transducers with reference to power requirement.

i) Describe the term "standardization", of a d.c. potentiometer. How is the standardization done for an a.c. potentiometer?

j) What is a volt-ratio box?

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Describe about different types of errors in measurement.

b) A moving coil voltmeter with a resistance of 20 Ω gives a full-scale deflection of 120^0 when potential difference of 100 mV is applied across it. The moving coil has a dimensions of 30 mm × 25 mm and is wounded with 100 turns. The control spring constant is 0.375×10^{-6} Nm/deg. Find the flux density in the air gap. Find also the diameter of the copper wire of coil winding if 30% of instrument resistance is due to coil winding. The specific resistance for Cu=1.7×10^{-8}Ωm.

c) An uncompensated spring-controlled dynamometer wattmeter reads 250 W with d.c. currents of 1 A and 0.05 A in its current and potential coils respectively. Calculate what this wattmeter will read when the current coil current is 10 sin $(377\ t + 15^0)$ + 5 sin (1131 t) ampere and the potential coil voltage is 500 cos $(377\ t - 30^0)$ +800 sin $(754\ t + 45^0)$ volt. Calculate also the resistance of the potential coil circuit assuming it to be purely resistive.

d) Describe the working of the Bridge for measurement of medium inductance. Derive the equations for balance.

e) What is the relation between power factor (PF) and dissipation factor (D) of the series RC circuit used in Schering Bridge for measurement of insulating properties and derive the expression for unknowns of the bridge

f) A basic slide wire potentiometer has a working battery voltage of 3.0 V with negligible internal resistance. The resistance slide wire is 400 Ω and it's length is200 cm. A 200 cm scale is placed along the slide wire. The slide wire has 1 mm scale divisions and is possible to read up to 1/5 of a division. The instrument is standardized with 1.018 V standard cell with sliding contact at the 101.8 cm mark on scale. Calculate :

i) Working current
ii) The resistance of series rheostat
iii) The measurement range, and
iv) The resolution of the instrument.

g) Define the terms "current sensitivity", "voltage sensitivity", "Megaohm sensitivity" as applied to d'Arsonaval galvanometers. Explain how current sensitivity of a galvanometer can be increased

h) Discuss the utility of an dc voltmeter using a FET input

i) How is true RMS responding voltmeter is advantageous? Explain it's working.

j) How is the electron beam focused to a fine spot on the face of Cathode Ray Tube, discuss with detailed diagrams

k) Derive the expression for deflection sensitivity of CRO.

l) What is the oscilloscope probe compensation? How is this adjusted? What effects are noted when the compensation is not correctly adjusted.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Describe the construction and working of a PMMC instrument. Derive the equation for deflection if the instrument is spring controlled. Describe the method of damping used in these instruments. **(16)**

Q4 **(16)**

a) Explain the constructional difference between Wheatstone and Kelvin double bridge.
b) Derive the equation of balance for the Kelvin Double bridge
c) The ratio arms of Kelvin bridge are 200Ω each. The Galvanometer has an internal resistance of 500 Ω & a current sensitivity of 200mm/μA. The unknown resistance Rx=0.1002 Ω and standard resistance is set at 0.1 Ω. A DC current of 10 A is passed through the standard & the unknown from a 2.2 V battery in series with a rheostat. The resistance of the yoke is neglected. Calculate i) the deflection of the galvanometer.ii) the resistance unbalance required to produce a galvanometer deflection of 1 mm?

Q5 **(16)**

a) Describe the principle of operation and construction of different types of metallic wire strain gauge.
b) Derive the expression of gauge factor for a metallic wire strain gauge.
c) A resistance, wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 100 MN/m^2. The modulus of elasticity of steel is $200GN/m^2$. Calculate the percentage change in the value of the gauge resistance due to the applied stress.

Q6 **(16)**

a) Describe the construction and working of a ballistic galvanometer.
b) Explain the difference in constructional detail of different types of a ballistic galvanometer and d' Arsonaval galvanometer.
c) Prove that in a ballistic galvanometer, the charge is proportional to first swing of the moving coil.
d) Describe the different methods used for calibration of a ballistic galvanometer.