SEAT No. :

PA-12

[5931] - 18

S.E. (Electrical)

ELECTRICAL MEASUREMENTS & INSTRUMENTATION

(2019 Pattern)(Semester-I)(203144)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) The inductance of MI instruments is given by, $L = 30 + 15\theta - 4\theta^2$ µH where θ is deflection in radians from zero. Spring constant is $25 * 10^{-6}$ N-m/rad. Estimate deflection in degrees for a current of 2.5 A. **[4]**

b) Define the following characteristics **[5]**
   i) Reproducibility
   ii) Drift
   iii) Accuracy
   iv) Linearity
   v) Speed of responce

c) Why is damping mechanism provided in indicating instruments? Explain with neat diagram, fluid friction damping system. **[6]**

OR

Q2) a) Describe the effect of CT secondary open circuit under loading condition. **[4]**

b) In an experiment, range of ammeter, voltmeter and wattmeter is to be extended by means of instrument transformers in single phase purely resistive load circuit. Following are the readings obtained in the meters connected on secondary circuit of instrument transformers. **[5]**
   Calculate
   i) load current,
   ii) voltage across load
   iii) power consumed by the load,
   iv) Nominal Ratio for PT,
   v) Transformation ratio for CT

P.T.O.

CT ratio 5:1, PT ratio – 440:110

I_2(A)	V_2(V)	W_2(Watts)
0.6	57	35

c) With neat diagram, explain construction and working of attraction type moving iron instrument. **[6]**

Q3) a) With neat diagram, deduce an expression for unknown inductance in Maxwell's inductance capacitance bridge. **[6]**

b) Draw neat diagram of Megger and label all the parts. **[4]**

c) The four arms of Maxwell's bridge network are as follows. **[5]** AB & BC are non-inductive resistors of 80Ω each, DA is standard variable inductor L in series with resistance $40\ \Omega$ & CD comprises a standard variable resistor R in series with unknown impedance. Balance is obtained when L = 52.2 mH & R = 2.3Ω. Find the resistance & reactance of coil.

OR

Q4) a) With neat diagram, derive the expression for unknown resistance in Kelvin's double bridge. **[6]**

b) Derive the general bridge balance equation of an AC bridge in polar form. **[4]**

c) In measurement of resistance R by ammeter – voltmeter method, the resistance of ammeter is 0.5Ω and that of voltmeter is 2200Ω. When ammeter is connected on supply side and voltmeter across the resistance R, current measured is 1.5 A and voltage 188 V.
Find the reading of voltmeter, if voltmeter is connected on supply side and across ammeter is connected in series with resistance R, if the current indicated by ammeter is 1.5 A. **[5]**

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