Code No: 135AN

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, December - 2019
ELECTRICAL MEASUREMENTS AND 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 as sub questions.

PART–A
(25 Marks)

1.a) Why is it preferable to have slightly under damped instrument? [2]

b) A permanent magnet moving coil instrument has a coil of dimension 18mm × 15mm, the flux density in the air gap is $1.6 \times 10^{-3} Wb/m^2$ and the spring constant is 0.1×10^{-6} Nm/rad. Determine the number of turns required to produce an angular deflection of 90^0 when a current of 3 mA is through the coil. [3]

c) Highlight the special features of the Diesselhorst potentiometer. [2]

d) A simple slide-wire is used for measurement of current in a circuit. The voltage drop across a standard resistance of 0.1Ω is balanced at 80 cm. Find the magnitude of the current if the standard cell emf of 1.25V is balanced at 40 cm. [3]

e) What is a Trivector meter? [2]

f) Briefly discuss the operating principle of Clock meters. [3]

g) Discuss the condition during which the Bridge sensitivity is maximum for a detector. [2]

h) What is Wagner earthing device? Why is it used in measurable by a.c bridges? [3]

i) Define the Gauge Factor of a Strain Gauge. [2]

j) A Piezoelectric crystal has a dimension of 5mm × 5mm × 1.25mm and has a voltage sensitivity of 0.05 V-m/N. It is used for the measurement of force. Calculate the magnitude of force if the voltage developed is 80V. [3]

PART–B
(50 Marks)

2. Explain the construction details of Repulsion – attraction type moving iron instrument. Derive the Torque equation for moving iron instrument. [10]

OR

3.a) What do you think are the permissible Errors in Ammeters and Voltmeters?

b) An electrostatic voltmeter consists of two attracted plates (movable and fixed provided with guard rings). When a potential difference of 10 KV is applied between the plates, there is a pull of 5×10^{-3} N on the movable plate. Find the change in capacitance produced due to the change in the position of the movable plate by 1mm. Diameter of the movable plate is 100mm. [4+6]

4. With the help of a neat circuit diagram explain Crompton's potentiometer and it's working. How a true zero is obtained in a Crompton's pot? [10]

OR

5. Describe the working principle of Larsen Potentiometer with the help of neat circuit. [10]

6. What are the various types of errors in induction type energy meter? Explain the methods incorporated for their compensation. [10]

OR

7. A dynamometer- type watt meter has a field system which may be considered long compared with its moving coils. The flux density is 0.012T. The mean diameter of the moving coil is 5cm and the moving coil turns are 600. The current through the coil is 0.06A and the power factor of the circuit of which the power is measured, is 0.866. Estimate the torque when the axis of the field and moving coil is 60^0. [10]

8. In Hay's bridge the four arms are arranged as under:
AB is a resistance of 600Ω in series with an inductor of 0.18 H, BC and DA are non-inductive resistances of 1200 Ω each and CD consists of a resistance R in series with a capacitor C. A potential difference of 3V at a frequency of 50Hz is applied between A and C. Determine the values of R and C. Derive the condition for bridge balance. [10]

OR

9. Show how the Wien's bridge can be used for the measurement of frequency in audio range. Derive the equation for frequency f. [10]

10.a) With the help of characteristics discuss the principle of operation of LVDT and its advantages.
   b) Enumerate the differences between a PN diode and a Photo diode and briefly explain the working of Photo diode. [6+4]

OR

11. Illustrate various methods for the measurement of acceleration and explain any one of them in detail. [10]

---ooOoo---