PVP 12

Code: EE4T2

II B.Tech - II Semester – Regular Examinations - JUNE 2015

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION (ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1 a) Derive the expression for torque equation for a moving iron instrument and comment upon the nature of scale. 7 M

b) The dimensions of the coil of PMMC voltmeter are 4 cm X 2.6 cm .The number of turns in the coil are 80 and the flux density in the air gap is 0.15Tesla. The resistance of the instrument is 15,000Ω. Calculate the deflecting torque produced in the instrument when a voltage of 300V is applied to its terminals. 7 M

2 a) A current transformer with a bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are 1.5Ω and 1.0Ω respectively including the transformer winding. With 5A flowing in the secondary winding, the magnetising MMF is 100A and the iron loss is 1.2 watts. Determine the ratio and phase angle errors. 7 M

b) Describe one method of testing of potential transformer. 7 M

3 a) Explain the construction and working of an electro-dynamometer type of wattmeter. 7 M

b) A 230V, 50Hz single phase energy meter has a constant of 200 revolutions per kwh. While supplying a non –inductive load of 4.4A at normal voltage, the meter takes 3 minutes for 10 revolutions. Calculate the percentage error of the instrument. 7 M

4 a) Draw a neat sketch of a Weston type frequency meter and explain its working. 7 M

b) The current taken by a small iron core choke coil is measured by a rectangular coordinate AC potentiometer. A 1.0 Ω non-inductive resistance is connected in series with the choke coil. The voltage measured across the resistance and the coils are (0.8-j0.75)V and (1.2+j0.3)V respectively. Assuming sinusoidal voltage and current determine the core loss in the coil. 7 M

5 a) Describe Carey Foster's slide wire bridge for the measurement of medium resistance. 7 M

b) The value of a high resistance is measured by loss of charge method. A capacitor having capacitance of 0.2μF is charged to a potential of 500V DC and is discharged through the high resistance. An electrostatic voltmeter, kept across the high resistance, reads the voltage as 300V at end of 60 seconds. Calculate the value of resistance. 7 M

6 a) An AC bridge is connected as follows: Branch AB is an inductive resistor, branch BC and ED are variable resistors, branches CD and DA are non-inductive resistors of 400Ω each and branch CE is a condenser of 2μF, the supply is connected to A and C and the detector to B and E. Balance is obtained when resistance of BC is 400Ω and that of ED is 500Ω. Determine the resistance and inductance of AB. 7 M

b) Derive the equation of balance of Schering bridge. Draw the phasor diagram under null conditions and explain how loss angle of capacitor can be calculated. 7 M

7 a) A resistance strain gauge is used to measure stress on steel. The steel is stressed to 1400 kgf/cm^2 . Assume Young's modulus of steel 2.1X10^6 kgf/cm^2.Calculate the percentage change of resistance of a strain gauge assuming gauge factor equal to 2. 7 M

b) Give construction and explain working of a thermocouple. Compare different thermocouple materials. 7 M

8 a) Explain the working of digital voltmeter with a block diagram. 7 M

b) Describe the working of a digital frequency meter with a neat sketch. 7 M