B.E.T.C.E 2ND YEAR 2ND SEMESTER EXAMINATION, 2017

SUBJECT: - ELECTRICAL MEASUREMENTS

Time: Three hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART-1	Marks
	Answer any three; 2 marks for well organized answers	
1.	**Justify and correct (if required) the following statements :**	(4X4=16)
a)	Self inductance can be measured by Schering Bridge.	
b)	Dual range DC potentiometer requires two separate dials.	
c)	Wheatstone bridge can be used for low resistance measurement.	
d)	Piezo-electric effect is important for high gauge factor of strain gauges	
2. a)	Define *gauge factor* and *transverse sensitivity* of a strain gauge.	2
b)	What are the properties of good strain gauge material? Comment on relative merits and demerits of semiconductor strain gauges over metal strain gauges.	3+3
c)	Derive the expression for measurement sensitivity of a Wheatstone bridge method based strain measurement with four active gauges.	8
3. a)	What are ratio and product bridge topologies for measurement of electrical quantities using AC bridges?	6
b)	An AC bridge is used to measure the impedance of a coil at 1kHz. The four arms of the bridge, i.e. AB, BC, CD and DA, under balanced condition are as follows: AB: Coil under test; BC: Resistance of 120 Ω; CD: Capacitance of 0.1 μF. DA: Resistance of 800 Ω in series with capacitance 0.125 μF. From the bridge balance equation calculate the parameters of the coil and also find out the power factor of the coil from these data.	6
c)	What are the importances of inter-bridge transformers in AC bridges?	4
4. a)	Low resistances are measured with four terminals- why?	4
b)	How can you use Kelvin's Double bridge method for measurement of low resistance?	8
c)	Why is a thick metal link (yoke) used in Kelvin's double bridge?	4
5.	**Write notes on *any two***	2×8 =16
a)	"Phantom Loading" for calibration of the wattmeter by dc potentiometer.	
b)	Condition for maximum sensitivity of Wheatstone bridge based resistance measurement	
c)	Series and shunt type ohmmeters	

BETCE-2ND YEAR ENGG. EXAMINATION, 2017
2nd Semester

SUBJECT: - ELECTRICAL MEASUREMENTS

Time: **Three hours**

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART- II	Marks
	Answer any Five.	
1.	Derive an expression of first swing θ_1 of a Ballistic galvanometer in terms of the short time charge Q passing through its coil, steady state deflection θ_F of the coil when excited by a steady current i and logarithmic decrement of the response.	10
2.	A D'Arsonval galvanometer attains a steady deflection of 0.74 *radian* when it is excited by a current of 100 μA. The meter has a coil with a resistance of 50 ohm and number of turns 200 turns. When an external resistance of 200 ohm is connected in series with the coil its total relative damping and open circuit damping are found to be 0.9 and 0.1, respectively. The length and width of the coil are 3 cm and 2 cm, respectively and the coil deflects in the magnetic field of 0.1 *wb/m²*. Determine for the meter a) natural angular frequency b) peak time	10
3.	An electrodynamometer type voltmeter, a moving iron voltmeter, a PMMC voltmeter and a PMMC-rectifier (full wave) voltmeter are connected in parallel. The entire combination is used to measure a voltage whose expression is given by $v = 30 + 90\sin(100\pi t + 30°) + 30\sin(300\pi t + 50°) + 40\sin(500\pi t + 20°)V$ What will be the reading of the voltmeters?	10
4.	An ammeter of internal impedance (0.2+j0.5) Ω is connected to the secondary of a 2000/5A current transformer (CT). The CT with secondary impedance of (0.1+j0.3)Ω has bar primary and 396 turns in its secondary, with 16AT and 8AT as its loss component and magnetizing component of	

	ampere turns, respectively. Determine the ratio error and phase error of the CT.	10
	Draw the corresponding phasor diagram.	
5.	Write short notes on any *One*:	10
	a) Electromagnetic damping in moving coil instrument	
	b) Errors of electrodynamometer type wattmeter	
6.	a) A PMMC type instrument has a resistance of 20Ω and gives full scale deflection when carrying a current of 40mA. Show how it can be used to measure i) Voltage up to 600V ii) Current up to 20A.	7
	b) When the range of the ammeter is extended, how is its damping affected?	3
7.	Derive an expression of amplitude response of Duddell's moving coil vibration galvanometer. How do you increase the amplitude of vibration?	10
8.	How do you compensate the effect of variation of temperature on a moving coil meter? Explain.	10