INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

ASSIGNMENT

Course Name	**:**	**Electrical and Electronics Instrumentation**
Course Code	**:**	**A60223**
Class	**:**	**III-B.TECH II SEM**
Branch	**:**	**Electrical and Electronics Engineering**
Year	**:**	**2017-2018**
Course Coordinator	**:**	**Mr. T Mahesh, Assistant Professor**
Course Faculty	**:**	**Mr. A Sathish Kumar, Assistant Professor**

OBJECTIVE:

This course deals with measuring instruments mainly indicating instruments and the associated torques, instrument transformers, power factor meter, frequency meter, synchro scopes, wattmeter, energy meter, potentiometer, resistance measuring methods, ac bridges, extension range of indicating instruments.

ASSIGNMENT - I

UNIT - I

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes
1	Distinguish between gross error, systematic error and random error with examples. What are the methods for their elimination / reduction?	Remember	1
2	Define magnetic effect, electro-static effect, heat effect, chemical effect, induction effect.	Understand	1
3	Derive the expression for value of multiplier in the multi-range voltmeter?	Understand	2
4	Discuss construction and operation of electrostatic voltmeter and derive torque equation?	Understand	3
5	Explain the construction and principle of attraction type of moving iron instrument and derive its torque equation?	Understand	2
6	Write about extension of range of ammeters and voltmeters?	Understand	1
7	Distinguish between the permanent magnet moving coil and moving iron instruments?	Understand	2
8	A coil of a moving coil voltmeter is 40 mm long and 30 mm wide and has 100 turns wound on it. The control spring exerts a torque of $0.25 * 10^{-3}$ Nm when the deflection is 50 divisions on the full scale. If the flux density of the magnetic field in the air gap is 1 Wb/m^2, estimate the resistance that must be put in series with the coil to give 1 V/division. Resistance of voltmeter is 10000 ohms.	Understand	2

9	A meter of resistance 50 ohms has a full scale deflection of 4 mA. Determine the value of shunt resistance required in order that full scale deflection should be (a) 15 mA (b) 20 A (c) 100 A	Understand	02
10	A moving coil ammeter has fixed shunt of 0.01 ohms. With a coil resistance of 750 ohms and a voltage drop of 400 mV across it, the full scale deflection is obtained. a) Calculate the current through shunt b) Calculate the resistance of meter to give full scale deflection if the shunted current is 50 A.	Understand	02
UNIT - II			
11	Discuss the steps for measurement of voltage and current using DC potentiometer?	Understand	05
12	Describe construction and working of polar type potentiometer. How is it standardized? What are the functions of transfer instrument and phase shifting transformers?	Understand	04
13	State and explain the essential features of construction of one type of AC potentiometer with help of neat sketch?	Understand	04
14	Design a volt- ratio box with a resistance of 20 ohms/V and ranges 3 V, 10V, 30 V, 100 V. the volt-ratio box is to be used with a potentiometer having a measuring range of 1.5 V.	Understand	05
15	Design a volt- ratio box with a resistance of 50 ohms/V and ranges 25 V, 50V, 75 V, 150 V and 300 V. the volt-ratio box is to be used with a potentiometer having a measuring range of 1.6 V.	Understand	05
16	Power is measured with an AC potentiometer. The voltage across 0.1 ohms standard resistance connected in series with load is (0.35-j0.1) V. The voltage across 300:1 potential divider connected to supply is (0.8+j 0.15) V. determines power consumed by load and power factor.	Understand	06
UNIT - III			
17	What are the special features that are incorporated into the electrodynamometer wattmeter for making a low power factor type of wattmeter?	Understand	08
18	Explain how the power in a three phase circuit is measured by the use of single wattmeter?	Understand	09
19	In a dynamometer type wattmeter, the moving coil has 500 turns of mean diameter 3 cm. calculate the torque if the axis of the field and moving coils are at i) 30^0 ii) 60^0 and iii) 90^0 the flux density in the field coil is 15 m Wb/m^2, the current in the moving coil is 0.5 A and power being measured has a power factor of 0.866.	Understand	08
20	A wattmeter has a current coil of 0.1 ohms resistance and a pressure coil of 6500 ohms resistance. Calculate the percentage errors, due to resistance only with each of the two methods of connection of wattmeter when reading the input to an apparatus which takes i) 12 A at 250 V with unity power factor and ii) 12 A at 250 V and 0.4 power factor.	Understand	08
ASSIGNMENT II			
UNIT - III			
1	A 230 V, single phase, watt hour meter has a constant load of 4 A passing through it for 6 hours at unity power factor. If the meter disc makes 2208 revolutions during this period, what is the meter constant in revolutions per kWh. Calculate the power factor of the load if the number of revolutions made by the meter are 1472 when operating at 230 V and 5 A for 4 hours.	Understand	10

2	A 220 V, 5 A DC energy meter is tested at its marked ratings. The resistance of the pressure circuit is 8800 ohms and that of current coil is 0.1 ohms. Calculate the power consumed when testing the meter with phantom loading with current circuit excited by a 6 V battery.	Understand	10
3	State the advantages and disadvantages of induction type energy meter?	Understand	10
4	Explain the construction of two elements and three elements of three phase energy meters.	Understand	10
	UNIT - IV		
5	State different problems associated with the measurement of low resistances. Explain principle of working Kelvin's double bridge and derive condition for balance.	Understand	11
6	Explain how insulation resistance of a cable can be measured with a help of loss of charge method.	Understand	11
7	Draw the circuit diagram and phasor diagram under balanced conditions for the Anderson's bridge. Also derive the equations under balances condition.	Understand	12
8	A Kelvin's double bridge is balanced with the following constants. Outer ratio = 100 ohms and 1000 ohms, Inner ratio arms = 99.92 ohms and 1000.6 ohms, resistance of link = 0.1 ohms, Standard resistance = 0.00377 ohms, calculate the value of unknown resistance.	Understand	11
9	A length of cable is tested for insulation resistance by loss of charge method. An electrostatic voltmeter of infinite resistance is connected between the cable conductor and earth, forming there with a joint capacitance of 600 pF. It is observed that after charging the voltage falls from 250 V to 92 V in one minute. Calculate the insulation resistance of the cable.	Understand	11
10	The four arms of the Maxwell's capacitance bridge at balances are: Arm ab: Unknown inductance L_1 having inherent resistance R_1, Arm bc : A non-inductive resistance of 1000 ohms, Arm cd : A capacitor of 0.05 uF in parallel with a resistance of 1000 ohms, Arm da : A resistance of 1000 ohms. Determine the values of R_1 and L_1. Draw the phasor diagram of the bridge.	Understand	13
11	A condenser brushing forms arm ab of a Schering bridge and a standard capacitor of 500 pF and negligible loss forms arm ad. Arm bc consists a non-inductive resistance of 300 ohms. When the bridge is balanced, arm cd has resistance of 72.6 ohms in parallel with a capacitance of 0.148 uF. The supply frequency is 50 Hz. Calculate the capacitance and dielectric loss angle of capacitor.	Understand	13
12	The four arm bridge ABCD, supplied with a sinusoid voltage, have the following values: AB = 330 ohms resistance in parallel with 0.2 uF capacitor. BC = 400 ohms resistance, CD = 800 ohms resistance: DA R in series with a 1.5 uF capacitor. Determine the value of R and supply frequency at which bridge will be balanced.	Understand	13
	UNIT - V		
13	Draw the block diagram of a general purpose CRO and explain the functions of various blocks.	Understand	16
14	Explain the electrostatic deflection method. Define electrostatic deflection sensitivity.	Understand	16
15	Explain the magnetic deflection method. Define magnetic deflection sensitivity.	Understand	16

16	An electro statically deflected cathode ray tube has plane parallel deflecting plates which are 2.5cm long and 0.5cm apart, and the distance from their center to the screen is 20cm. The electron beam is accelerated by a potential difference of 2500v and is projected centrally between the plates. Calculate the deflecting voltage required to cause the beam to strike a deflecting voltage and find the corresponding deflection of the screen	Understand	16
17	A resistive position transducer with a resistance of 10 k ohm and a shaft stoke of 10 cm is applied with a voltage of 5 V. When the wiper is 3 cm from the reference, what is the output voltage?	Understand	14
18	Calculate the thermoelectric sensitivity of a device using Bismuth and Tellurium. Estimate the maximum output voltage for a 100 degree temperature difference at room temperature using one junction. Sensitivity of Bi is -72 uV/^{0}C and of Tellurium is 500 uV/^{0}C.	Understand	14
19	A strain gauge with a gauge factor of 4 has a resistance of 500Ω. It is to be used in a test in which the strain to be measured may be as low as 5x10-6. What will the change in resistance of gauge be?	Understand	15
20	A strain gauge having an unstrained resistance of 350Ω and a gauge factor of 2 is connected in series with a ballast resistance across a 10V supply. The ballast resistance is designed to give maximum sensitivity. The gauge is subjected to a dynamic strain of (10+20sin314t) micro strain.(a) Find the expression for the change in output voltage on account of strain.(b) If a capacitor is connected in one output lead and if the voltage is read by true rms.	Understand	15

Prepared by:
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