

2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER REGULAR EXAMINATIONS

ELECTRICAL MEASUREMENTS

(ELECTRICAL & ELECTRONICS ENGINEERING)

NOVEMBER 2005

TIME: 3 HOUR
MARK: 80

ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS

1. (a) Derive the expression for capacitance to be connected across the multiplier of a moving iron voltmeter so as to make its circuit non inductive for frequencies up to 125Hz.
- (b) The copper coil of a 150V moving iron voltmeter has a resistance of 400 ohm and 150C and an inductance of 0.75H. The current for full scale deflection is 0.05A. The temperature coefficients of resistance for copper and eureka at 150C are 0.004/0C and 0.00001/0C respectively. Calculate
- The percentage increase of resistance of this instrument per degree rise in temperature
 - The indication when 150V at 100Hz is applied, the instrument having been previously calibrated on direct current.
2. (a) Why electro static instruments cannot be used for measurement of low volt- ages while electromagnetic instruments can be? Illustrate your answer with some specific example comparing the energy densities produced in electrostatic instruments and electromagnetic instruments.
- (b) The movable range of a quadrant electrometer turns through 40 scale divisions when it is idiostatically connected to a potential of 100V. When it is used heterostatically with the quadrants connected to a small voltage "e" and the needle to a 100v supply, the deflection is 15 scale divisions. Determine the voltage "e".
3. (a) Explain the 3 voltmeter method of power measurement with the help of vector & connection diagrams
- (b) In a dynamometer wattmeter the moving coil has 500 turns of mean diameter 30mm. Estimate the torque if the axes of the field & the moving coils are at
- 600
 - 900 when the flux density produced by field coils is $15 \times 10^{-3} \text{wb/m}^2$, the current in moving coil is 0.05A & the power factor is 0.866.
4. (a) Draw a neat sketch showing the construction of a single phase induction type energy meter. Give the theory & operation of the instrument
- (b) An energy meter is designed to make 100 revolutions of the disc for one unit of energy. Calculate the no. of revolutions made by it when connected to a load carrying 20A at 230volts at 0.8 pf for an hour. If it actually makes 360 revolutions, find the percentage error.
5. Describe the construction and working of a Weston type synchroscope. How is it assured that the
- Incoming machine has the same voltage as that of the bus bars and also whether they are in phase with each other (or) note
 - Incoming machine has the same phase sequence as the busbars to which it has to be connected.
 - Frequency of the incoming machine is same as that of the busbars.
 - Incoming machine is Faster or slower than the bus bars.

6. Describe the construction and working of a polar type potentiometer. How is it standardized? What are the functions of the transfer instrument and the phase shifting transformer?

7. (a) Discuss the advantages and disadvantages of Anderson's bridge.

(b) The arms of Five node bridge are as follows :

arm ab : an unknown impedance (R_1, L_1) in series with a non-inductive variable resistor x_1

arm bc : a non inductive resistor $R_3 = 100\Omega$

arm cd : a non inductive resistor $R_4 = 200\Omega$

arm da : a non inductive resistor $R_2 = 250\Omega$

arm de : a non inductive variable resistor r

arm ec : a loss-less capacitor $C = 1\ \mu\text{F}$,

and arm be : a detector An a.c. supply is connected between a and c. Calculate the resistance and inductance R_1, L_1 , when under balanced conditions

$r_1 = 43.1$ and $r = 229.7$

8. (a) Describe briefly the different types of tests that are used for testing of magnetic materials.

(b) Explain the principle of operation of Ballistic galvanometer with neat circuit diagram?

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