Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018
Course Code: EE208
Course Name: MEASUREMENTS AND INSTRUMENTATION (EE)

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 5 marks

Marks

1. Resistance of unknown resistance determined by Wheatstone bridge given by $R_4 = R_1 R_2 / R_3$ where limiting values of various resistances are $R_1 = 500\Omega + 1\%$, $R_2 = 615\Omega$ 1%. $R_3 = 100\Omega + 0.5\%$. Calculate: (5)
   i) Nominal value of unknown resistor
   ii) Absolute error of unknown resistor in ohm.
   iii) Limiting error in percentage of unknown resistor.

2. Classify resistances based on the range of measurement. With neat sketch describe the loss of charge method for the measurement of insulation resistance of length of a cable.   (5)

3. Define the terms related to instrument transformer: (5)
   i) Transformation ratio   ii) Nominal Ratio   iii) Burden.

4. Describe the method for determination of B-H curve of magnetic material using step-by step method.   (5)

5. With the help of diagram indicate the calibration of wattmeter using dc potentiometer.   (5)

6. Describe bonded and unbonded strain gauge with their principle of operation.   (5)

7. What is Lissajous pattern? Clearly indicate the factors on which shape of these figures depends.   (5)

8. Compare temperature measurement using RTD and thermistors.   (5)

PART B
Answer any two questions, each carries 10 marks

9. a) Draw the block diagram of a typical measurement system and indicate the functional elements in detail.   (5)

   b) Describe the construction and working principle of single phase induction type energy meter.   (5)

10. a) A moving coil ammeter has fixed shunt of 0.01Ω. With a coil resistance of 750Ω and a voltage drop of 500mV across it, the full scale deflection is obtained. (i) Calculate current through shunt. (ii) Calculate resistance of meter to give full scale deflection if shunted current is 60A.   (5)

    b) Give the construction and working principle of dynamometer type instrument. Also indicate the different errors in dynamometer type watt meters.   (5)

11. a) With the help of neat sketch describe the method of measurement of earth resistance.   (5)

    b) The coil of a moving coil voltmeter is 40 mm long and 30 mm wide and has 100 turns on it. The control spring exerts a torque a torque of 240×10^{-6} Nm when the deflection is 100 divisions on full scale. If the flux density of magnetic field in air-gap is 1wb/m^2. Calculate the resistance that must be put in series with the coil to give 1V/division. The resistance of voltmeter coil may be neglected.   (5)

PART C
Answer any two questions, each carries 10 marks

12 a) Give the basic principle of working of an electrostatic voltmeter. Also describe how would you increase operating forces   (5)

    b) Describe an experiment for obtaining flux density in a specimen of magnetic material with the help of ballistic galvanometer.   (5)

13 a) Mention the digital methods for determining rotational speed.   (5)

    b) A 1000/5A, 50 Hz current transformer has a secondary burden comprising a non-inductive impedance of 1.6Ω. The primary winding has one turn. Calculate the flux in the core and ratio error at full load. Neglect leakage reactance and assume iron loss in the core to be 1.5W at full load and mmf=100A.   (5)

14 a) State the components of iron loss and write down their expressions.   (3)

    b) Describe the working of hall effect sensors.   (4)

    c) A solenoid 1m long and wound with 960 turns has a search coil of 60 turns and cross-sectional area 340mm^2 at its centre.Reversing a current of 3.5A in the solenoid causes a deflection of 4 divisions in a ballistic galvanometer connected to the search coil.Calculate: (3)
i)Galvanometer constant in flux linkages per division ii) Flux linkage sensitivity

PART D
Answer any two questions, each carries 10 marks

15 a) Define transducers and classify them.   (5)

    b) Using Schering bridge show how capacitance and dissipation factor of unknown capacitor is measured.   (5)

16 a) Draw the block diagram of generalized digital data acquisition system and describe the function of each component.   (5)

    b) Draw the block diagram of digital Storage oscilloscope. State the three modes of operation   (3)

    c) Define the deflection sensitivity of CRT.   (2)

17 a) With the help of neat sketch explain the working of LVDT. Also draw its characteristics.   (5)

    b) Determine the equivalent parallel resistance and capacitance that causes a Wein bridge to null with the following component values. R_1=2.7K, C_1=5μF, R_2=22K, R_4=100K operating frequency 2.2KHz.   (5)

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