

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 2386 F-4 Your Roll No.....

Unique Paper Code : 2511405

Name of the Course : **B.Tech Instrumentation**

Name of the Paper : Measurement Science and Techniques

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt five questions in all.
3. Question No. 1 is compulsory.
4. Use of scientific calculator is allowed.

1. (a) Draw the circuit of Wheatstone bridge. What are the conditions required for balancing the bridge ? (3)
- (b) Why are "make before break switches" used in multirange ammeters ? (3)
- (c) Calculate the value of multiplier resistance on 60V range on a dc voltmeter that uses a 100  $\mu$ A meter movement with an internal resistance of 80 $\Omega$ . (3)
- (d) Why is Schmitt trigger and amplifier used in universal counter ? (3)
- (e) Differentiate between lumped and cavity wavemeters. (3)
2. (a) Derive balance condition of Maxwell's bridge. (7)

P.T.O.

- (b) An ac bridge is balanced at frequency of 5 kHz and has the following constants :

Arm AB has a capacitor of 0.5 micro farads in parallel with 4 kilo ohms resistor

Arm AD has a resistance of 2 k $\Omega$

Arm BC has a capacitor of 0.25  $\mu$ F

Arm CD has unknown impedance

Identify the bridge, draw its circuit and find its unknown parameters. (5)

- (c) What is the range of Q factor which can be measured using Hay Bridge ?  
Why it can be used to measure higher values of Q ? (3)

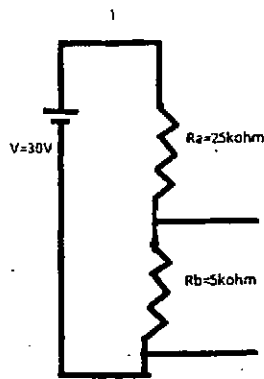
3. (a) What is the basic working principle of successive approximation DVM ?  
Give its advantages. (7)

- (b) Two different voltmeters are used to measure the voltage across  $R_b$  in a circuit. The meters are as follows :

Meter 1:  $S=2$  Kilo ohms/V and  $R_m=0.5$  Kilo ohms, range=10V

Meter 2:  $S=20$  kilo ohms/V and  $R_m=1.5$  Kilo ohms, range=10V

- (i) Calculate the voltage across the  $R_b$  without any meter across it.
- (ii) Calculate the voltage across  $R_b$  when the meter 1 is used.
- (iii) Calculate the voltage across  $R_b$  when the meter 2 is used and
- (iv) Find the error in the voltmeter readings.



( $R_m$  is internal resistance of PMMC) (5)

- (c) How is shunt type ohmmeter calibrated? (3)
4. (a) Explain the working of digital storage oscilloscope. (7)
- (b) What is the need of delay line in a CRO and how does it works? (5)
- (c) Explain how the glitches are detected in logic analyzers. (3)
5. (a) Draw the block diagram for function generator? What is basic working principle of a audio frequency sine wave signal generator? (7)
- (b) Explain the working of random noise generator. (5)
- (c) What are logic probes and where are they used? (3)
6. (a) Draw and explain the block diagram of a universal counter? Name its different modes of operation. (8)
- (b) How does a harmonic distortion analyzer work? Explain with the help of suitable diagram? (5)
- (c) What is phosphorescence? (2)

7. (a) Derive the expression for the measurement of high impedances in Q meter. (8)
- (b) Find the value of a self-capacitance of a coil when the following measurements are made : At frequency 3MHz, the tuning capacitor is set at 470 pf. When the frequency is increased to 6 MHz, the tuning capacitor is tuned at 80 pf. (5)
- (c) What are connectors ? State their any two applications. (2)