

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5822

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Unique Paper Code : 2512041203

Name of the Paper : Electronic Instrumentation (Core)

Name of the Course : B.Sc. Instrumentation (NEP UGCF Mode)

Semester : II

Duration : 3 Hours

Maximum Marks : 90

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. Use of scientific calculator is allowed.

- Q.1 (a) What is loading effect observed in voltmeter? How can it be resolved? (3)
- (b) In a Q meter, self capacitance of a coil is measured. The first measurement is at $f_1=4\text{MHz}$ and the value of capacitance $C_1=800\text{pF}$. The second measurement is at $f_2=8\text{MHz}$ and the value of capacitance $C_2=300\text{pF}$. Find the value of distributed capacitance. (3)
- (c) Draw the block diagram of Random Noise Generator. (3)
- (d) Calculate the value of R_{sh} for an ammeter with 5mA meter movement and internal resistance of 400Ω . The range of the ammeter is $0-250\text{mA}$. Draw the circuit for the designed ammeter. (3)
- (e) In a balanced Wheatstone Bridge, the resistances in three arms are given as $R_1 = 5\text{ k}\Omega$, $R_2 = 10\text{ k}\Omega$, and $R_3 = 30\text{ k}\Omega$. Determine the value of the unknown resistance R_x in the fourth arm. (3)
- (f) Draw one Lissajous pattern obtained when a 6 kHz frequency signal is connected to vertical (f_y) and 2 kHz frequency signal (f_x) is connected to the horizontal section of a CRO. (3)
- Q.2 (a) Explain the working of Dual slope integrating type DVM with the help of block diagram. (7)
- (b) Explain the working of AC voltmeter with full wave rectifier. Also derive the formulae for multiplier resistance R_s for the AC voltmeter with full wave rectifier. (7)
- (c) A Schering bridge is used to measure a capacitive impedance. The bridge constants at balance are $C_1=0.4\mu\text{F}$, $R_1=5\text{k}\Omega$, $R_2=10\text{k}\Omega$, $C_3=0.6\mu\text{F}$ and $f=2\text{kHz}$. Find the series equivalent of the unknown impedance and dissipation factor. (4)

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- Q.3 (a) Explain the working of gate control flip flop used in measurement of frequency in basic circuit of digital frequency meter. (7)
(b) Explain the working of square wave generator using block diagram. (7)
(c) What is gating error in universal counter? Calculate the crossover frequency of the universal counter if crystal frequency of the instrument is 64KHz. (4)
- Q.4 (a) Derive the formulae for deflection sensitivity (S) of a CRT. (7)
(b) What is the application of a Sampling Oscilloscope? Describe its operation with help of a block diagram. (7)
(c) Explain the working of vertical deflection system of a CRO with help of a block diagram. (4)
- Q.5 (a) Derive the value of Q factor for measuring low value resistors, small coils and large capacitors. (7)
(b) What is a Spectrum Analyzer? Explain its operation with help of a block diagram. (7)
(c) Explain the working of a basic wave analyzer. (4)
- Q.6 (a) Design an Aryton shunt to provide an DC ammeter with current ranges of 0-2mA, 10mA and 20mA, using D'Arsonval movement having internal resistance of 60Ω and full-scale current of $200\mu\text{A}$. (7)
(b) Which parameter is measured using Wein's Bridge? Draw its circuit and derive the formulae for the unknown parameter. (7)
(c) A $3\frac{1}{2}$ digital voltmeter is used for voltage measurement (4)
(i) Find its resolution.
(ii) How would 0.6589 be displayed on 1V and 10V range?
- Q.7 (a) What is post deflection acceleration in a CRO and why is it required? How it is achieved in CRO? (7)
(b) What is the basic working principle of Harmonic Distortion Analyzer? Explain any one method to design a Harmonic Distortion Analyzer. (7)
(c) In a lissajous figure obtained while calculating unknown phase, $2a=5\text{cm}$ and $2b=12\text{cm}$. Find the phase difference obtained. Also draw the figure obtained for this measurement. (4)