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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech VI Semester End Examinations (Regular) - May, 2019

Regulation: IARE – R16

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Time: 3 Hours

(ECE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) List the different static characteristics of an instrument and explain each in detail. [7M]

(b) Design a multirange ammeter with ranges of 0-100 mA, 0-200 mA, 0-500mA, 0-1A employing individual shunts for each range. A D'Arsonval movement with an internal resistance of 500Ω and a full scale current of $100\mu\text{A}$ is available. Calculate the values of individual resistors. [7M]
- (a) State the advantages of Digital Volt Meter(DVM) over an analog meter. Illustrate the operating principle of a ramp type DVM. [7M]

(b) A voltmeter having a sensitivity of $20\text{k}\Omega/\text{V}$ reads 100V units 150V scale, when connected across an unknown resistor R_x . The current passing through the resistor is 2.0mA . Calculate the % error due to loading effect. [7M]

UNIT – II

- (a) Describe with diagram the operation of a sampling CRO. State the function of the staircase generator used in sampling CRO. [7M]

(b) The deflection sensitivity of a CRT is 0.05mm/V and an unknown voltage is applied to the horizontal deflection plate, which shifts the spot by 5mm towards the right. Determine the unknown applied voltage. [7M]
- (a) Explain how frequency can be measured by a CRO using Lissajous figures? [7M]

(b) Determine the secondary emission ratio 'S' of a digital storage oscilloscope, if the value of secondary emission current I_S is $15\mu\text{A}$, and the primary beam current I_P is $150\mu\text{A}$. [7M]

UNIT – III

- (a) Define wave analyzer? Explain the working of the harmonic distortion analyzer? [7M]

(b) Determine the dynamic range of a spectrum analyser with a third order intercept point of $+40\text{dBm}$ and a noise level of -100dBm . [7M]

6. (a) Write short notes on sweep frequency generator with a neat block diagram. [7M]
 (b) What is the minimum detectable signal of a spectrum analyzer with a noise figure of 20dB and using a 1-kHz, 3-dB filter? [7M]

UNIT – IV

7. (a) Explain with a diagram how Schering's bridge can be used to measure unknown capacitance? [7M]
 (b) An Anderson bridge consists of the following:
 Arm AD having resistance value of 500Ω
 Arm CD having resistance of 1000Ω
 Arm ED having a resistance of 600Ω
 Arm EC having capacitor of $0.5\mu\text{F}$
 Arm BC having resistance value of 300Ω
 Arm AB having resistance and inductance in series.
 Determine the value of the unknown resistance and unknown inductance. [7M]
8. (a) State and derive the two balance conditions for a Wien's bridge. How can a Wien bridge be used to measure frequency? [7M]
 (b) An unbalanced Wheatstone bridge has the following standard arms:
 $R_1=1\text{K}\Omega$, $R_2=2\text{K}\Omega$, $R_3=3\text{K}\Omega$, $R_4=4\text{K}\Omega$, $R_g=300\Omega$ and $E=5\text{V}$. Calculate the current through the galvanometer. [7M]

UNIT – V

9. (a) What is an LVDT? Why the secondary windings of LVDT is connected in series opposition? [7M]
 (b) An LVDT has a secondary voltage of 5.0 V for a displacement of 12.5 mm. Determine the output voltage for a core displacement of 8.0 mm from its central position. [7M]
10. (a) With neat diagram, explain the working principle of manometer for measuring pressure. [7M]
 (b) A resistance strain gauge with a gauge factor of 2 is cemented to a steel member, which is subjected to a strain of 1×10^{-6} . If original resistance value of the gauge is 130Ω , calculate the change in resistance. [7M]

