

Hall Ticket No

--	--	--	--	--	--	--	--	--	--

Question Paper Code: AEC014



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER - I

Four B.Tech VI Semester End Examinations

Regulations: IARE-R16

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

(Only for ECE)

Time:3hours

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

- 1 a) A voltmeter having a sensitivity of $1\text{K}\Omega/\text{V}$ is connected across an unknown resistance in series with a milli ammeter reading 80V on 150V scale. When the milli ammeter reads 10mA, Calculate the,
i. Apparent resistance of the unknown resistor
ii. Actual resistance of the unknown resistor, and
iii. Error due to the loading effect of the voltmeter? [7M]
- b) How the working of a potentiometer type digital voltmeter be explained? Determine the Multiplier resistance on the 50V range of a DC voltmeter, which uses 300mA meter movement having internal resistance of 1.2Ω [7M]
- 2 a) Define PMMC? Explain in detail about the working principle of PMMC movement with the neat block diagram and equations. [7M]
- b) A basic D'Arsonval movement with a full scale deflection of $100\ \mu\text{A}$ and an internal resistance of $2000\ \Omega$ is available. It is to be Converted into a 0-5V, 0-10V, 0-25V, and 0-50V multi range voltmeter using individual multipliers for each range. Calculate the values of the individual resistors. [7M]

UNIT – II

- 3 a) Explain the working of Dual Beam CRO with neat block diagram. Explain about Delay lines in CROs. [7M]
- b) Determine the Velocity of electron beam of an oscilloscope when voltage applied is 2500V [7M]
- 4 a) Determine the secondary emission ratio 'S' of a digital storage oscilloscope, if the value secondary emission current I_S is $15\ \mu\text{A}$, and the primary beam current I_P is $150\ \mu\text{A}$. [7M]
- b) Explain the method of finding frequency relationship of two waveforms using Lissajous figures? [7M]

UNIT – III

- 5 a) Explain the working of Basic Spectrum Analyzer with neat schematic block diagram. List out the applications of Spectrum Analyzer? [7M]
- b) Explain the working of heterodyne wave analyzer with neat diagram. Distinguish between wave analyzer and Harmonic distortion analyzer. [7M]

- 6 a) Discuss about the generation of broadband sweep frequencies using a sweep generator. List out the applications of sweep generator? [7M]
- b) What is Heterodyning and explain the use of Heterodyning in spectrum analyzer along with its circuit diagram. [7M]

UNIT – IV

- 7 a) Draw and explain the Maxwell Bridge with neat diagram and derive the expression for unknown inductance. [7M]
- b) A Maxwell bridge is used to measure inductive impedance. The bridge constants at balance are $C1=0.01\mu\text{F}$, $R1=470\text{k}\ \Omega$, $R2=5.1\text{k}\ \Omega$ and $R3=100\text{k}\ \Omega$. Find the series equivalent of the unknown impedance? [7M]
- 8 a) Explain the Kelvin Bridge with neat diagram and derive the expression for unknown resistance. [7M]
- b) In a certain Wheatstone bridge circuit measurements, $R_A=200\text{k}\ \Omega$, $R_B=400\text{k}\ \Omega$, $R_C=100\text{k}\ \Omega$, $R_D=300\text{k}\ \Omega$. $E=1.5\text{V}$, $R_g=100\ \Omega$, with usual notation. Determine the current through the detector galvanometer. [7M]

UNIT – V

- 9 a) Explain about Piezo-electric effect? Explain the operation of a Piezo electric transducer. [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 $130\ \Omega$, calculate the change in resistance. [7M]
- 10 a) Explain the Principle and working of Strain gauges. Explain working of strain gauge and what are its specific advantages? [7M]
- b) An ac LVDT has the following data. Input = 6.3V, Output = 5.2V, range ± 0.5 in. Determine [7M]
- i. Calculate the output voltage vs core position for a core movement going from +0.45in. to -0.30 in.
 - ii. The output voltage when the core is -0.25 in. from the centre



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

COURSE OBJECTIVES

The course should enable the students to:

I	Acquire a sound understanding theory and performance characteristics of instruments and errors in measurement and apply to DC voltmeters, ammeters, ohmmeters.
II	Provide concepts and operation of different signal generators and wave form analyzers.
III	Compare and contrast different types of oscilloscopes.
IV	Select different types of D.C and A.C bridges for measurement of passive components and physical parameters.

COURSE OUTCOMES (COs):

CO 1	Describe the types of voltmeters, ammeters, ohmmeters and Dynamic characteristics of measuring systems
CO 2	Understand the different types of Oscilloscopes and their working principles.
CO 3	Understand the Different types of signal generators and signal analyzers and their working principles
CO 4	Explore the different types of A.C.and DC Bridges and their operations
CO 5	Demonstrate the different types of transducers and their principles and operations

COURSE LEARNING OUTCOMES

Students who complete the course will have demonstrated the ability to do the following

AEC014.01	Analyze Block schematics of measuring systems, performance characteristics like accuracy, precision, resolution and the types of errors.
AEC014.02	Understand the analog measuring instruments its working of analog measuring instruments D' Arsonval movement.
AEC014.03	Discuss various types measuring range meters like DC and AC voltmeters ammeters.
AEC014.04	Understand of basic building of Cathode ray oscilloscopes and cathode ray tubes its specifications and applications.
AEC014.05	Illustrate the various types of special purpose oscilloscopes and discuss Lissajous figures, frequency measurement, phase measurement, CRO probes.
AEC014.06	Understand working principle of signal generators like AF and RF signal generators and Discuss the types of function generators.
AEC014.07	Understand the function of various types of signal analyzers and discuss the type like AF, HF wave analyzers.
AEC014.08	Understand the various wave analyzers heterodyne wave analyzers, harmonic distortion, spectrum analyzers, power analyzers.
AEC014.09	Discuss various measurements using DC bridges for Wheat stone bridge, Kelvin bridge.
AEC014.10	Discuss various measurements using AC bridges, Maxwell, Hay, Schering, Wien, Anderson bridges, wagner & ground connection.
AEC014.11	Understand transducers and its classifications and discuss strain gauges, force and displacement transducers, resistance thermometers, hotwire anemometers, LVDT, thermocouples, synchros.
AEC014.12	Discuss the types of transducers Piezoelectric transducers, variable capacitance transducers; Magneto strictive transducers
AEC014.13	Determine measurement of physical parameters Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture
AEC014.14	Illustrate the following: active and passive, primary and secondary transducers
AEC014.15	Illustrate the measurement of physical parameters of transducer like velocity, force, pressure, high pressure, vacuum level, temperature measurements

AEC014.16	Apply the concept of Electronic measurement and instrumentation to understand and analyze the real time applications.
AEC014.17	Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

SEE Question No.		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AEC014.01	Analyze Block schematics of measuring systems, performance characteristics like accuracy, precision, resolution and the types of errors.	CO 1	Understand
	b	AEC014.01	Analyze Block schematics of measuring systems, performance characteristics like accuracy, precision, resolution and the types of errors.	CO 1	Understand
2	a	AEC014.03	Discuss various types measuring range meters like DC and AC voltmeters ammeters.	CO 1	Remember
	b	AEC014.02	Understand the analog measuring instruments its working of analog measuring instruments D' Arsonval movement.	CO 1	Understand
3	a	AEC014.04	Understand of basic building of Cathode ray oscilloscopes and cathode ray tubes its specifications and applications	CO 2	Understand
	b	AEC014.04	Understand of basic building of Cathode ray oscilloscopes and cathode ray tubes its specifications and applications	CO 2	Understand
4	a	AEC014.05	Illustrate the various types of special purpose oscilloscopes and discuss Lissajous figures, frequency measurement, phase measurement, CRO probes.	CO 2	Remember
	b	AEC014.05	Illustrate the various types of special purpose oscilloscopes and discuss Lissajous figures, frequency measurement, phase measurement, CRO probes..	CO 2	Understand
5	a	AEC014.06	Understand working principle of signal generators like AF and RF signal generators and Discuss the types of function generators.	CO 3	Remember
	b	AEC014.07	Understand the function of various types of signal analyzers and discuss the type like AF, HF wave analyzers.	CO 3	Remember
6	a	AEC014.06	Understand working principle of signal generators like AF and RF signal generators and Discuss the types of function generators.	CO 3	Understand
	b	AEC014.08	Understand the various wave analyzers heterodyne wave analyzers, harmonic distortion, spectrum analyzers, power analyzers.	CO 3	Remember
7	a	AEC014.10	Discuss various measurements using AC bridges, Maxwell, Hay, Schering, Wien, Anderson bridges, wagner& ground connection.	CO 4	Remember
	b	AEC014.09	Discuss various measurements using DC bridges for Wheat stone bridge, Kelvin bridge	CO 4	Understand
8	a	AEC014.09	Discuss various measurements using DC bridges for Wheat stone bridge, Kelvin bridge	CO 4	Remember
	b	AEC014.10	Discuss various measurements using AC bridges, Maxwell, Hay, Schering, Wien, Anderson bridges, wagner& ground connection.	CO 4	Understand

9	a	AEC014.12	Discuss the types of transducers Piezoelectric transducers, variable capacitance transducers; Magneto strictive transducers	CO5	Understand
	b	AEC014.11	Understand transducers and its classifications and discuss strain gauges, force and displacement transducers, resistance thermometers, hotwire anemometers, LVDT, thermocouples, synchros.	CO5	Remember
10	a	AEC014.13	Determine measurement of physical parameters Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture	CO5	Understand
	b	AEC014.11	Understand transducers and its classifications and discuss strain gauges, force and displacement transducers, resistance thermometers, hotwire anemometers, LVDT, thermocouples, synchros.	CO5	Understand

Signature of Course Coordinator

HOD, ECE