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Question Paper Code: AEC014



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## MODEL QUESTION PAPER -II

Four B.Tech VI Semester End Examinations, April - 2020

**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) | List out the different types of errors that occur in measurements, and explain in detail about them.? | [7M] |
|   | b) | Explain the working principle of PMMC movement with the help of equations.                            | [7M] |
| 2 | a) | Describe the basic performance characteristics of a system? Explain in detail about it.               | [7M] |
|   | b) | How the working of a potentiometer type digital voltmeter be explained.                               | [7M] |

#### UNIT – II

- |   |    |   |      |
|---|----|---|------|
| 3 | a) | Draw the neat diagrams of both vertical & horizontal deflection systems and explain briefly about their working.  | [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 $15\mu A$ , and the primary beam current $I_P$ is $150\mu A$ . | [7M] |
|   | b) | Draw the neat diagrams of both vertical & horizontal deflection systems and explain briefly about their working.  | [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 procedure of measurement of a harmonic distortion analyzer using a bridged-T type                                     | [7M] |
| 6 | a) | Define signal generator. List various types of signal generators used in measurement systems.                                     | [7M] |
|   | b) | Explain the procedure of measurement of a harmonic distortion analyzer using a bridged-T type.                                    | [7M] |

#### UNIT – IV

- |   |    |   |      |
|---|----|---|------|
| 7 | a) | Why is Hay's bridge suited for measurement of inductance of high Q coils?   | [7M] |
|   | b) | What are the different problems associated with measurement of low resistances? Explain the principal of working a Kelvin's double bridge. Draw the circuit of a Kelvin's double bridge used for the measurement of low resistances. Write the condition for balance. | [7M] |

- 8 a) State the limitations of wheatstone bridge and how to overcome those limitations. [7M]  
b) In a certain Wheatstone bridge  $R_b=400k\Omega$ ,  $R_c=100k\Omega$ ,  $R_d=300k\Omega$  usual notation. [7M]  
Determine the current through the detector galvanometer.

#### UNIT – V

- 9 a) A resistance strain gauge with a gauge factor of 2 is cemented to a steel member, which is subjected to a strain of  $1 \times 10^{-6}$ . If original resistance value of the gauge is  $130\ \Omega$ , calculate the change in resistance.. [7M]  
b) Explain the Principle, working, Construction, characteristics and applications of thermistors. [7M]
- 10 a) A resistance strain gauge with a gauge factor of 2 is fastened to a steel member subjected to a stress of  $1050\ \text{kg/cm}^2$ . The modulus of elasticity of steel is approximately  $2.1 \times 10^6\ \text{kg/cm}^2$ . Calculate the change in resistance  $\Delta R$ , of the strain-gage element due to the applied stress. [7M]  
b) Explain the Principle, working, Construction, characteristics and applications of thermistors. [7M]



# 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**