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Code No: AME019



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech VII Semester End Examinations (Regular), November – 2019

Regulation: IARE-R16

INSTRUMENTATION AND CONTROL SYSTEMS (ME)

Time: 3 hours

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) Explain the various elements of generalized measurement system with a neat sketch. [7M]
b) Explain the dynamic performance characteristics of measuring instruments. [7M]
2. a) Why is calibration of instruments needed? Elaborate on the procedure adopted for calibrating instruments. [7M]
b) With suitable examples, explain how flow measuring instruments are calibrated by the primary and secondary calibration methods. [7M]

UNIT – II

3. a) What is the application of inductive transducer? Explain the calibration procedure for inductive transducer. [7M]
b) Explain how a resistance potentiometer is used to measure displacement, with its advantages and limitations. [7M]
4. a) Briefly discuss on a differential transformer being used for measuring displacement. [7M]
b) List electrical transducers for measurement of linear and angular displacement. Also Explain the construction and working of a photo-electric transducer. [7M]

UNIT – III

5. a) Explain the bellows arrangement used to measure differential pressure. Give their advantages and limitations. [7M]
b) Discuss the working of a strain gauge as pressure measuring device by enumerating the applications, advantages and limitations. [7M]
6. a) Explain the McLeod vacuum gauges used for pressure measurement and its limitations. [7M]
b) Explain the Pirani-gauge and the thermocouple type conductivity gauge. List their merits and limitations. [7M]

UNIT – IV

7. a) With suitable diagram briefly explain the details of a pendulum scale and discuss the applications. [7M]
b) What is the practical application of unequal arm balance in engineering? Discuss in detail on an unequal arm balance. [7M]

8. a) Give the various types of pendulum scales for different engineering applications. [7M]
Explain with a diagram a pendulum scale of multi lever type.
- b) Discuss various engineering applications where the measurement of force [7M]
is important. Explain the method of measuring force using a strain gauge load cell

UNIT – V

9. a) Explain open-loop control system with neat sketch. Give the applications of open- [7M]
loop control system.
- b) Discuss the advantages and limitations of open-loop control system. Explain briefly [7M]
two examples of open-loop control systems.
10. a) Explain closed-loop control system with neat sketch. Give the applications of [7M]
closed-loop control system.
- b) Discuss the advantages and limitations of closed-loop control system. Also Explain [7M]
briefly an example of closed-loop control systems



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COURSE OBJECTIVES:

I	Visualize the concepts of measurement and dynamic performance characteristics of measuring instruments.
II	Understand the measurement of typical physical quantities like displacement, temperature, pressure, discharge, and speed.
III	Applying techniques for measurement of Level, Flow, Speed, Acceleration and Vibration.
IV	Visualize the measurement of Stress, Strain, Humidity, Force, Torque and Power.
V	Understand the control systems for instrumentation and develop Temperature, Speed and Position control systems.

COURSE OUTCOMES:

CO 1	Ability to describe the static and dynamic characteristics, identify functional elements of generalized measuring system and error control.
CO 2	Ability to analyze and design the measuring system for the measurement of displacement, temperature and Pressure
CO 3	Ability to analyze and design the measuring system for the measurement of Flow and liquid level.
CO 4	Ability to analyze and design the measuring system for the measurement of stress, strain, humidity, force and torque.
CO 5	Ability to analyze & design the control system for control of position, temperature, acceleration & process control.

COURSE LEARNING OUTCLOMES:

CLO Code	CLO's	At the end of the course, the student will have the ability to:
AME019.01	CLO 1	Understand the basic principles and measurement system.
AME019.02	CLO 2	Comprehend generalized configuration and functional description of measuring instruments.
AME019.03	CLO 3	Visualize static and dynamic performance characteristics.
AME019.04	CLO 4	Understand the sources of various errors and its elimination.
AME019.05	CLO 5	Apply the working principles and identify the measurands for displacement.
AME019.06	CLO 6	Evaluate temperature measuring methods in various equipments.
AME019.07	CLO 7	Understand the fluid pressure, its importance and measurement techniques.
AME019.08	CLO 8	Comprehend the level measuring devices for ascertaining liquid level.
AME019.09	CLO 9	Visualize the importance of flow measurement and know various flow measuring
AME019.10	CLO 10	Evaluate the measurement of speed in engineering applications and importance of speed measurement in instrumentation.
AME019.11	CLO 11	Comprehend the importance of acceleration and vibration measurement with various
AME019.12	CLO 12	Visualize the stress and strain experienced by various elements and understand the importance of strain measurement with various techniques.
AME019.13	CLO 13	Understand the concept of humidity in atmosphere as well as the storage applications and maintenance of humidity by measurement.
AME019.14	CLO 14	Apply the basic principles of instrumentation for force measurement in various fields
AME019.15	CLO 15	Apply the basic principles and characteristics for torque measurement.
AME019.16	CLO 16	Comprehend the instrumentation techniques in solving the engineering measuring
AME019.17	CLO 17	Understand the control systems for instrumentation in various practical applications.
AME019.18	CLO18	Classify the control systems, advantages, limitations and control system terminology.
AME019.19	CLO19	Comprehend servo mechanism, process control and regulators for process and position control.

AME019.20	CLO20	Apply control system for control of position, temperature and acceleration.
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MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES

SEE Question No		Course Learning Outcomes	Course Outcomes	Bloom's Taxonomy Level
1	a	AME019.03 Visualize static and dynamic performance characteristics.	CO 1	Understand
	b	AME019.03 Visualize static and dynamic performance characteristics.	CO 1	Understand
2	a	AME019.03 Visualize static and dynamic performance characteristics.	CO 1	Remember
	b	AME019.03 Visualize static and dynamic performance characteristics.	CO 1	Remember
3	a	AME019.05 Apply the working principles and identify the measurands for displacement.	CO 2	Remember
	b	AME019.05 Apply the working principles and identify the measurands for displacement.	CO 2	Understand
4	a	AME019.05 Apply the working principles and identify the measurands for displacement.	CO 2	Understand
	b	AME019.05 Apply the working principles and identify the measurands for displacement.	CO 2	Understand
5	a	AME019.07 Understand the fluid pressure, its importance and measurement techniques.	CO 3	Remember
	b	AME019.07 Understand the fluid pressure, its importance and measurement techniques.	CO 3	Remember
6	a	AME019.07 Understand the fluid pressure, its importance and measurement techniques.	CO 3	Understand
	b	AME019.07 Understand the fluid pressure, its importance and measurement techniques.	CO 3	Remember
7	a	AME019.14 Apply the basic principles of instrumentation for force measurement in various fields of engineering.	CO 4	Understand
	b	AME019.14 Apply the basic principles of instrumentation for force measurement in various fields of engineering.	CO 4	Remember
8	a	AME019.14 Apply the basic principles of instrumentation for force measurement in various fields of engineering.	CO 4	Remember
	b	AME019.14 Apply the basic principles of instrumentation for force measurement in various fields of engineering.	CO 4	Remember
9	a	AME019.18 Classify the control systems, advantages, limitations and control system terminology.	CO 5	Understand
	b	AME019.18 Classify the control systems, advantages, limitations and control system terminology.	CO 5	Understand
10	a	AME019.18 Classify the control systems, advantages, limitations and control system terminology.	CO 5	Understand
	b	AME019.18 Classify the control systems, advantages, limitations and control system terminology.	CO 5	Remember

Signature of Course Coordinator

HOD, ME