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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) Draw the block diagram of a generalized measurement system and explain its various elements. [7M]
b) With the help of an example, explain the generalized measurement system. [7M]
2. a) Broadly classify the measuring instruments and explain the applications of measuring instruments in detail. [7M]
b) List the various types of measuring instruments and explain each one of them. [7M]

UNIT – II

3. a) Design a measurement system for displacement measurement using LDR (Light dependent resistor) as sensor. [7M]
b) Explain the principle of working of a pyrometer. With the help of a neat diagram. [7M]
4. a) Explain the use of thermocouples for the measurement of average temperature of a room. [7M]
b) Write about RTDs? On what basic principle do they work? Explain with diagram one of the RTDs. [7M]

UNIT – III

5. a) Explain with neat sketch principle and working of Laser Doppler Anemometer mention advantages and disadvantages. [7M]
b) Discuss the importance of magnetic flow meter in flow measurement. Explain the working of a magnetic flow meter. [7M]
6. a) What are the various applications of ultrasonic waves in engineering? Explain the ultrasonic flow meter using the travel time difference method. [7M]
b) State the principle and describe the working of a rotameter. Enumerate its Applications, advantages and limitations. [7M]

UNIT – IV

7. a) What is strain? Compare and explain the difference between positive strain and negative strain. [7M]

b) Define gauge factor. Enumerate what does it indicate if a strain gauge has a low gauge factor? [7M]

8. a) Give the importance of strain measurement. Explain how an unbounded strain gauge is used to measure strain. [7M]

b) Briefly give the classification of strain gauges. Discuss the advantages and disadvantages of unbounded strain gauges. [7M]

UNIT – V

9. a) Give the comparison for pneumatic and hydraulic control systems. Explain with neat sketch the working of pneumatic control systems [7M]

b) Give the comparison for pneumatic and hydraulic control systems. Explain with neat sketch the working of hydraulic control systems. [7M]

10. a) Explain with block diagrams any one speed control system. [7M]

b) Enumerate the various engineering applications where measuring systems are involved with instruments. Explain the functions of instruments and measuring systems. [7M]



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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
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
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

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.

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES

SEE Question No		Course Learning Outcomes	Course Outcomes	Bloom's Taxonomy Level	
1	a	AME019.02	Comprehend generalized configuration and functional description of measuring instruments.	CO 1	Understand
	b	AME019.02	Comprehend generalized configuration and functional description of measuring instruments.	CO 1	Understand
2	a	AME019.02	Comprehend generalized configuration and functional description of measuring instruments.	CO 1	Remember
	b	AME019.02	Comprehend generalized configuration and functional description of measuring instruments.	CO 1	Understand
3	a	AME019.06	Evaluate temperature measuring methods in various equipments.	CO 2	Remember
	b	AME019.06	Evaluate temperature measuring methods in various equipments.	CO 2	Understand
4	a	AME019.06	Evaluate temperature measuring methods in various equipments.	CO 2	Remember
	b	AME019.06	Evaluate temperature measuring methods in various equipments.	CO 2	Remember
5	a	AME019.09	Visualize the importance of flow measurement and know various flow measuring devices.	CO 3	Remember
	b	AME019.09	Visualize the importance of flow measurement and know various flow measuring devices.	CO 3	Understand
6	a	AME019.09	Visualize the importance of flow measurement and know various flow measuring devices.	CO 3	Remember
	b	AME019.09	Visualize the importance of flow measurement and know various flow measuring devices.	CO 3	Understand
7	a	AME019.12	Visualize the stress and strain experienced by various elements and understand the importance of strain measurement with various techniques.	CO 4	Remember
	b	AME019.12	Visualize the stress and strain experienced by various elements and understand the importance of strain measurement with various techniques.	CO 4	Understand
8	a	AME019.12	Visualize the stress and strain experienced by various elements and understand the importance of strain measurement with various techniques.	CO 4	Remember
	b	AME019.12	Visualize the stress and strain experienced by various elements and understand the importance of strain measurement with various techniques.	CO 4	Understand
9	a	AME019.20	Apply control system for control of position, temperature and acceleration.	CO 5	Understand
	b	AME019.20	Apply control system for control of position, temperature and acceleration.	CO 5	Remember
10	a	AME019.20	Apply control system for control of position, temperature and acceleration.	CO 5	Remember
	b	AME019.20	Apply control system for control of position, temperature and acceleration.	CO 5	Remember

Signature of Course Coordinator

HOD, ME