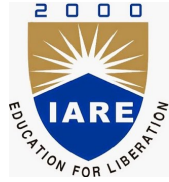


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Question Paper Code: AME019



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech VII Semester End Examinations, November 2020

Regulations: IARE - R16

INSTRUMENTATION AND CONTROL SYSTEMS

Mechanical Engineering

Time: 3 hour

Maximum Marks: 70

Answer ONE Question from each MODULE

All Questions Carry Equal Marks

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

MODULE-I

- (a) What are the various elements of generalized measurement system? Show with a neat sketch. [7m]

(b) Explain the dynamic performance characteristics of measuring instruments. [7m]
- (a) Why is calibration of instruments needed? Select 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]

MODULE-II

- (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]
- (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]

MODULE-III

- (a) Explain the bellows arrangement used to measure differential pressure. Give their advantages and limitations. [7m]

(b) With the working of a strain gauge as pressure measuring device by enumerating the applications, advantages and limitations. [7m]
- (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]

MODULE-IV

7. (a) What is the practical application of unequal arm balance in engineering? Discuss in detail on an unequal arm balance. [7m]
(b) With suitable diagram briefly explain the details of a pendulum scale and discuss the applications. [7m]
8. (a) List the various types of pendulum scales for different engineering applications. Explain with a diagram a pendulum scale of multi lever type. [7m]
(b) Discuss various engineering applications where the measurement of force is important. Explain the method of measuring force using a strain gauge load cell. [7m]

MODULE-V

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

****END OF EXAMINATION****

COURSE OBJECTIVES:

The course should enable the students to:

1	The fundamental knowledge of measuring principles, configuration and functional description of instruments with static, dynamic inputs and error control.
2	The concepts and working of instrumentation devices for displacement, flow, dynamic and other mechanical measurement applications.
3	Instrumentation practices and automatic control system for monitoring industrial real time processes within limits of parameter specifications.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

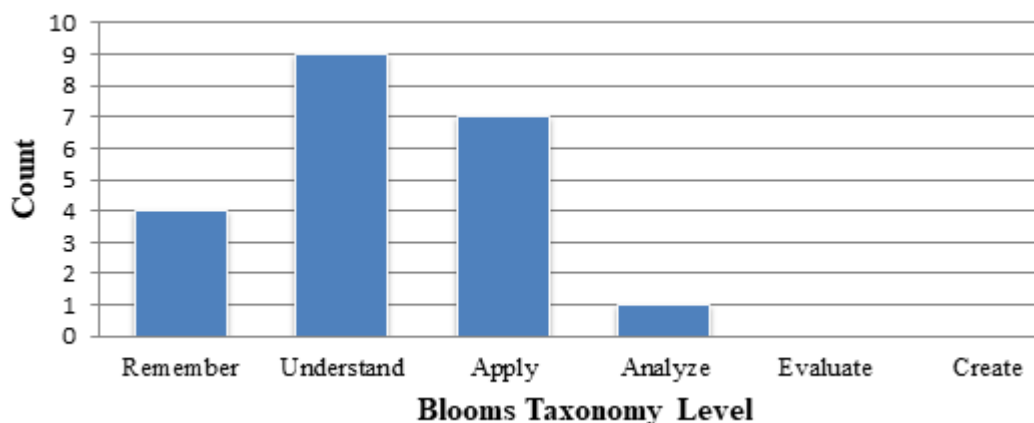
CO 1	Recognize the importance of basic principles, configuration and functional description of measuring instruments.
CO 2	Describe performance characteristics of an instrument when the device is exposed to measure dynamic inputs and error control.
CO 3	Categorize the measuring instruments based on the principle of working with the physical parameters such as displacement, temperature and pressure.
CO 4	Explain calibration of instruments for measurement of all types of mechanical parameters.
CO 5	Demonstrate working principle of level measuring devices for ascertaining liquid level and choose appropriate device for controlling fluid level in industrial applications.
CO 6	Discuss the theory, phenomena and working principle of flow measuring instruments and calibration.
CO 7	Make use of appropriate instrument for measuring Speed, Acceleration and Vibration by considering different aspects.
CO 8	Demonstrate the concepts for measurement of Stress, Strain, Humidity and their application for finding stress, strain, and humidity.
CO 9	Describe the principles of measurement of force, torque and power and their application in industries for finding force, torque and power.
CO 10	Apply relevant control systems for speed, position and control processes in practical applications.

MAPPING OF SEMESTER END EXAMINATION QUESTIONS TO COURSE OUTCOMES

Q.No		All Questions carry equal marks	Taxonomy	CO's	PO's
1	a	What are the various elements of generalized measurement system? Show with a neat sketch.	Remember	CO 1	PO 1
	b	Explain the dynamic performance characteristics of measuring instruments.	Understand	CO 2	PO 1
2	a	Why is calibration of instruments needed? Select the procedure adopted for calibrating instruments.	Remember	CO 1	PO 2
	b	With suitable examples, explain how flow measuring instruments are calibrated by the primary and secondary calibration methods.	Apply	CO 2	PO 1
3	a	What is the application of inductive transducer? Explain the calibration procedure for inductive transducer.	Remember	CO 3	PO 1
	b	Explain how a resistance potentiometer is used to measure displacement, with its advantages and limitations.	Understand	CO 4	PO 1
4	a	Briefly discuss on a differential transformer being used for measuring displacement	Understand	CO 3	PO 1
	b	List electrical transducers for measurement of linear and angular displacement. Also Explain the construction and working of a photo-electric transducer.	Apply	CO 4	PO 2
5	a	Explain the bellows arrangement used to measure differential pressure. Give their advantages and limitations.	Understand	CO 5	PO 1
	b	With the working of a strain gauge as pressure measuring device by enumerating the applications, advantages and limitations.	Apply	CO 6	PO 2
6	a	Explain the McLeod vacuum gauges used for pressure measurement and its limitations.	Remember	CO 6	PO 1
	b	Explain the Pirani-gauge and the thermocouple type conductivity gauge. List their merits and limitations.	Understand	CO 6	PO 2
7	a	What is the practical application of unequal arm balance in engineering? Discuss in detail on an unequal arm balance.	Understand	CO 7	PO 1
	b	With suitable diagram briefly explain the details of a pendulum scale and discuss the applications.	Apply	CO 8	PO 2

8	a	List the various types of pendulum scales for different engineering applications. Explain with a diagram a pendulum scale of multi lever type.	Understand	CO 7	PO 1
	b	Discuss various engineering applications where the measurement of force is important. Explain the method of measuring force using a strain gauge load cell.	Analyze	CO 8	PO 2
9	a	Explain open-loop control system with neat sketch. Give the applications of open- loop control system.	Understand	CO 9	PO 1
	b	Identify the advantages and limitations of open-loop control system. Explain briefly two examples of open-loop control systems.	Apply	CO 10	PO 2
10	a	Explain closed-loop control system with neat sketch. Give the applications of closed-loop control system.	Understand	CO 9	PO 1
	b	Identify the advantages and limitations of closed-loop control system. Also Explain briefly an example of closed-loop control systems.	Apply	CO 10	PO 2

KNOWLEDGE COMPETENCY LEVELS OF MODEL QUESTION PAPER



Signature of Course Coordinator
Dr. GVR Seshagiri Rao, Associate Professor

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