Hall Ticket No: | | | | | | | | | | |

Question Paper Code: AEE511

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

Third Year B. Tech V Semester End Examinations (Regular), November – 2019

Regulation: IARE–R16

INDUSTRIAL AUTOMATION AND CONTROL

(EEE)

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 Architecture of Industrial automation system and with example describe the each layer in automation pyramid.	[7M]
	b)	Illustrate any Three methods for measuring the temperature in an industry with neat diagrams.	[7M]
2	a)	Discuss the construction and operating principle of LVDT and state the functioning of phase sensitive detector (PSD) in a LVDT circuit.	[7M]
	b)	Name two methods of noncontact type speed measurement and explain with a schematic diagram the principle of operation of any one of them.	[7M]

UNIT – II

3	a)	Describe the different design methodologies for designing a controller in order to achieve desired performance level.	[7M]
	b)	Explain the importance of tuning of controller for a particular process and name the three experimental techniques for controller tuning.	[7M]
4	a)	Distinguish between position algorithm and velocity algorithm for implementation of digital P-I-D controller.	[7M]
	b)	Draw the general block diagram of a feed forward-feedback control scheme and develop the transfer function of the feedback controller	[7M]

UNIT – III

5	a)	Define Sequence and Logic Control and State three major differences between Logic Control and Analog Control.	[7M]
	b)	Design an RLL Diagram for the Forward and Reverse Control of a motor in an industrial process.	[7M]
6	a)	Explain the following; i). On delay Timer ii) Off delay Timer iii) Retentive and Non-Retentive Timer	[7M]

	b)	Describe the physical organization of hardware in the PLC and State the typical components and functionality of the main types of modules	[7M]

UNIT – IV

7	a)	Define Numerical Control and describe its advantages and disadvantages of Numerical Control.	[7M]
	b)	Name three types of control valves used in a process control and sketch their ideal flow characteristics	[7M]
8	a)	Describe the principles of operation of hydraulic actuator system and list out its advantages	[7M]
	b)	Describe the major types of direction control valves with their construction, operation and symbol.	[7M]

UNIT – V

9	a)	Identify the major constructional difference between a permanent magnet and variable reluctance type motor	[7M]
	b)	Draw and Explain the block diagram of a typical speed control loop for a separately excited dc motor.	[7M]
10	a)	Describe the advantages and disadvantages of a PWM inverter over a square wave inverter.	[7M]
	b)	Describe the Closed Loop Control of a BLDC Drive and list the typical applications of BLDC motor	[7M]

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COURSE OBJECTIVES:
The course should enable the students to:

I	Learn the fundamental concepts about introduction to industrial automation and control and devices.
II	Study the performance of each system in detail along with practical case studies.
III	Develop various types of industrial automation and control and devices.
IV	Understand the process control of PLC automation.

COURSE OUTCOMES (COs):

CO 1	Describe working of various blocks of basic industrial automation system.
CO 2	Analyse various control aspects for the automation application.
CO 3	Construct a program using PLC to problems pertaining to automation industries.
CO 4	Describe the principal and operation of CNC machines and actuators.
CO 5	Distinguish various industrial drives for the industrial automation.

COURSE LEARNING OUTCOMES:
Students, who complete the course, will have demonstrated the ability to do the following:

S. No	Description
AEE511.01	Describe the various elements of an Industrial Automation Systems and how they are organized hierarchically in levels.
AEE511.02	Define the different terms used for characterizing the performance of an instrument/ measurement system.
AEE511.03	Name the different methods of measuring temperature, pressure, force, displacement and speed.
AEE511.04	Study the signal conditioning circuits, different types of errors.
AEE511.05	Write the input-output relationship of a P-I-D controller
AEE511.06	Justify the use of feed forward and ratio control schemes.
AEE511.07	Explain the two schemes for predictive control suggest a suitable compensation scheme for control of a process with inverse response.
AEE511.08	Define Sequence and Logic Control and Name the major functions performed by a PLC.
AEE511.09	Describe the hardware structure of a PLC Program and the execution of a PLC Program.
AEE511.10	Describe motivations for formal modeling in the design of sequence control programs for an industrial control problem.
AEE511.11	Describe the physical organization of hardware in the PLC.

AEE511.12	Define Numerical Control and describe its advantages and disadvantages.
AEE511.13	Name the types of control valves and sketch their ideal flow characteristics.
AEE511.14	Describe the principles of operation of hydraulic systems and understand its advantages.
AEE511.15	Describe pressure switches, as well as pressure and flow gauges used in hydraulic systems.
AEE511.16	Demonstrate energy saving with variable speed drive method of flow control compared to throttling.
AEE511.17	Explain with schematic diagrams, open loop and closed loop control schemes used for step motors.
AEE511.18	Define the different terms used for characterizing the performance of an instrument/ measurement system

MAPPING OF MODEL QUESTION PAPER QUESTIONS TO THE ACHIEVEMENT OF COURSE OUTCOMES

SEE QUESTION No.		COURSE LEARNING OUTCOMES		Course Outcomes	BLOOM'S TAXONOMY LEVEL
1	a	AEE511.01	Describe the various elements of an industrial automation systems and how they are organized hierarchically in levels.	CO 1	Remember
	b	AEE511.03	Name the different methods of measuring temperature	CO 1	Remember
2	a	AEE511.03	Name the different methods of measuring temperature	CO 1	Understand
	b	AEE511.03	Name the different methods of measuring temperature	CO 1	Remember
3	a	AEE511.05	Write the input-output relationship of a P-I-D controller	CO 2	Understand
	b	AEE511.05	Write the input-output relationship of a P-I-D controller	CO 2	Understand
4	a	AEE511.05	Write the input-output relationship of a P-I-D controller	CO 2	Understand
	b	AEE511.06	Justify the use of feed forward and ratio control schemes.	CO 2	Understand
5	a	AEE511.08	Define Sequence and Logic Control and Name the major functions performed by a PLC.	CO 3	Remember
	b	AEE511.09	Describe the hardware structure of a PLC Program and the execution of a PLC Program.	CO 3	Understand
6	a	AEE511.09	Describe the hardware structure of a PLC Program and the execution of a PLC Program.	CO 3	Remember
	b	AEE511.11	Describe the physical organization of hardware in the PLC.	CO 3	Understand
7	a	AEE511.12	Define Numerical Control and describe its advantages and disadvantages.	CO 4	Remember
	b	AEE511.13	Name the types of control valves and sketch their ideal flow characteristics.	CO 4	Remember
8	a	AEE511.14	Describe the principles of operation of hydraulic systems and understand its advantages.	CO 4	Understand
	b	AEE511.13	Name the types of control valves and sketch their ideal flow characteristics.	CO 4	Remember

9	a	AEE511.18	Describe the operational features of dc motor drives, Induction motor drives, BLDC motor drives for Electrical actuators.	CO 5	Remember
	b	AEE511.17	Explain with schematic diagrams, open loop and closed loop control schemes used for step motors.	CO 5	Understand
10	a	AEE511.16	Demonstrate energy saving with variable speed drive method of flow control compared to throttling.	CO 5	Remember
	b	AEE511.18	Describe the operational features of dc motor drives, Induction motor drives, BLDC motor drives for Electrical actuators.	CO 5	Understand

Signature of Course Coordinator **HOD, EEE**