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Question Paper Code: AEEB58



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - DECEMBER 2022

Regulation: R18

INDUSTRIAL AUTOMATION AND CONTROL

Time: 3 Hours (ELECTRICAL AND ELECTRONICS ENGINEERING)

Max Marks: 70

Answer FIVE Questions choosing ONE question from each module

All Questions Carry Equal Marks

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

MODULE – I

1. (a) Classify the errors in measuring systems and determine the quantitative measures for systematic errors. [BL: Understand| CO: 2|Marks: 7]
(b) Interpret the levels in process automation. Explain the significance of each level of process automation hierarchy. [BL: Understand| CO: 1|Marks: 7]
2. (a) Demonstrate sensitivity, precision, and bandwidth aspects of measurement system. Identify the nature of each of these aspects of measuring system. [BL: Understand| CO: 2|Marks: 7]
(b) Explain the construction and principle of operation of a Bourdon tube pressure gauge with a neat diagram. [BL: Understand| CO: 2|Marks: 7]

MODULE – II

3. (a) Sketch the scheme for implementing hydraulic P-I control. Identify various components for feedback, error detection, control and actuation. Discuss the working of each component. [BL: Understand| CO: 3|Marks: 7]
(b) Consider a single tank system for water filling with delay. Draw the physical system and control block diagram. Interpret the manipulated variable and disturbance for this process. [BL: Apply| CO: 3|Marks: 7]
4. (a) Interpret the step-by-step procedure for tuning PID controller through Ziger- Nicholas method. Determine the controller coefficients in terms of measure parameters. [BL: Understand| CO: 3|Marks: 7]
(b) Illustrate the scheme of model predictive control. Considering a gauge thickness control mechanism, develop model predictive control for this system utilizing Smith predictor. [BL: Apply| CO:3|Marks: 7]

MODULE – III

5. (a) List the programming methods for PLC. Identify the merits and de-merits of each programming method. [BL: Understand| CO:4|Marks: 7]
(b) Summarize sequence and logic control. Develop the sequential functional chart for industrial stamping process. [BL: Apply| CO: 4|Marks: 7]

6. (a) Illustrate the characteristics and functions of I/O module of a programmable logic controller. [BL: Understand| CO: 4|Marks: 7]
- (b) Distinguish between PLC pulse delay, ON delay and OFF delay timers with appropriate timing diagrams of input and output signals. [BL: Understand| CO: 4|Marks: 7]

MODULE – IV

7. (a) Describe directional valves by providing symbol, constructional features, and operational principles. [BL: Understand| CO: 5|Marks: 7]
- (b) Discuss accuracy and control resolution aspects of numerical position control system. [BL: Understand| CO: 5|Marks: 7]
8. (a) Explain the open loop and closed loop computer numerical control of process. Distinguish between the operation of spring loaded and gas charged accumulators [BL: Understand| CO: 5|Marks: 7]
- (b) Demonstrate the functions and characteristics of industrial hydraulic systems with a neat sketch. [BL: Understand| CO: 5|Marks: 7]

MODULE – V

9. (a) Identify the need for sensors in BLDC motor control. Explain the constructional features and back emf, and torque development in BLDC motor [BL: Understand| CO: 6|Marks: 7]
- (b) Discuss the operation of voltage source inverter based variable frequency induction motor drive. [BL: Understand| CO: 6|Marks: 7]
10. (a) Draw the block diagram of electric drive and discuss the criteria for selection of electric drive for given application. [BL: Understand| CO: 6|Marks: 7]
- (b) "Stepper motor is employed for open loop control of workable position control". Justify with appropriate reasoning. [BL: Apply| CO: 6|Marks: 7]

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