**Registration Number:** | | | | | | | | | | | |

**PSNA College of Engineering and Technology**

**Department of Electrical and Electronics Engineering**

**SERIAL TEST-2**

**Industrial Control Electronics**

Year/Sem : I/II Max.Marks:50

Staff In-charge: **M.Kaliamoorthy** Time: 1.5 Hrs

**Part A (9 * 2 = 18)**

Answer any **NINE** questions

1. Define Automation
2. Define Control and Differentiate automated systems and control systems.
3. What you want to control is not equal to what you can control Justify this statement with an example.
4. Differentiate open loop control system with closed loop control system
5. What are the different types of analog controllers?
6. Draw the basic circuit diagram for Difference amplifier using op-amp with necessary equations.
7. Draw the basic circuit diagram for inverting summer using op-amp with necessary equations.
8. Draw the responses of controllers for proportional action, Integral action and Derivative action
9. Define Dead band.
10. Draw the responses of controllers for Proportional derivative action, Proportional Integral action and Proportional Integral and derivative actions.

**Part B (2 *16 = 32)**

Answer **ALL** questions

11. (a) (i) Discuss in detail about the op amp circuit based Error amplifiers (Differential Amplifier and Inverting Summer). (6)

(ii) Discuss in detail about the ON-OFF controller with an example. Also construct the operational amplifier circuit for ON-OFF controller and derive the necessary equations (6)

(iii) Analyze the operation of the op amp based ON-OFF controller circuit for $R_1$=100 k$\Omega$, $R_2$=10 k$\Omega$, $\pm V_{sat}$= $\pm$ 10V, $V_{sp}$=5V (4)

(a) Calculate the size of the dead band.

(b) Out put voltage at $U_2$ when $V_{pv}$= 3Volts

(c) Out put voltage at $U_2$ when $V_{pv}$ is increased to 7 Volts

(d) Out put voltage at $U_2$ when $V_{pv}$ is increased to 5 Volts

**(Or)**

(b) (i) Discuss in detail about the P controller with the operational amplifier circuit and derive the necessary equations (6)

(ii) For the op amp based P controller circuit diagram with $V_{sp}$=6V, $V_{os}$=5V, $R_{os}$=$R_F$=100 k$\Omega$, $R_i$=22K$\Omega$ and $V_z$=10V, Calculate the following values

(a) Output Voltage with $V_{pv}$= 5.5 Volts

(b) Output Voltage with $V_{pv}$= 4 Volts (4)

(iii) Discuss in detail about the I controller with the operational amplifier circuit and derive the necessary equations (6)

12 (a) (i) Discuss in detail about the PI controller with the operational amplifier circuit and derive the necessary equations (10)

(ii) Discuss in detail about the D controller with the operational amplifier circuit and derive the necessary equations (6)

**(Or)**

(b) (ii) Discuss in detail about the D controller with the operational amplifier circuit and derive the necessary equations (16)

**Staff in charge** **HOD/EEE**