JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-VIII Semester (OE)

COURSE CODE (CREDITS): 20B1WEC731 (3) MAX. MARKS: 25
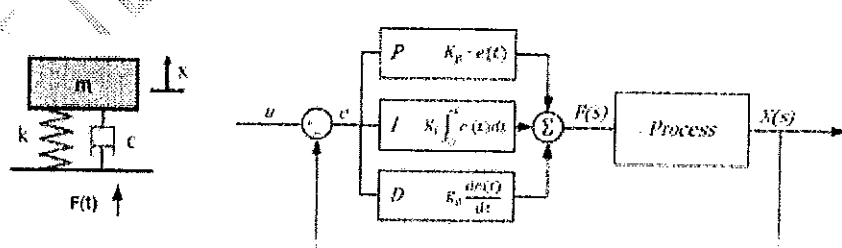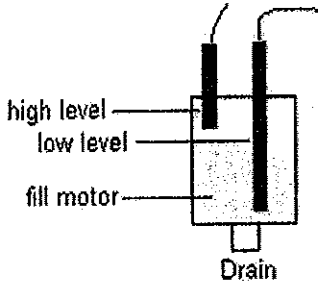
COURSE NAME: Automation and Robotics

COURSE INSTRUCTORS: EPN MAX. TIME: 1 Hour 30 Min

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required

for solving problems

Q.No	Question	CO	Marks
Q1	Briefly explain the working of an ultrasound sensor. How does it measure distance?	CO4	2
Q2	What does 'degree of freedom' refer to? Describe the degrees of freedom for a cylindrical joint and a rotational joint.	CO3	2
Q3	Explain the functional structure of a typical sensor system? Include a block diagram and provide a brief description of the role of each component.	CO4	3
Q4	What are the 'Three Laws of Robotics' proposed by Isaac Asimov to ensure the ethical behavior of robots and prevent potential harm or chaos?	CO3	3
Q5	Write a Python program to simulate a mass-damper-spring system shown below. Plot the output of the system with unity feedback to a unit step input with a PID controller.	CO3	5
Q6	With a neat diagram, describe and explain the various components and features of Supervisory Control and Data Acquisition (SCADA) systems used in industrial applications.	CO2	5

| Q7 | Oil is consumed randomly from an oil tank. The tank needs to be refilled by turning on a pump. Two hydrostatic switches are used to detect a high and low level. The pump should be switched ON if the oil level goes below the low hydrostatic switch. The pump should be switched OFF if the oil level goes above the high hydrostatic switch. Draw a suitable Ladder Logic Diagram for this problem and explain its function.

 high level ────
 low level ────
 fill motor ────

 Drain | CO2 | 5 |