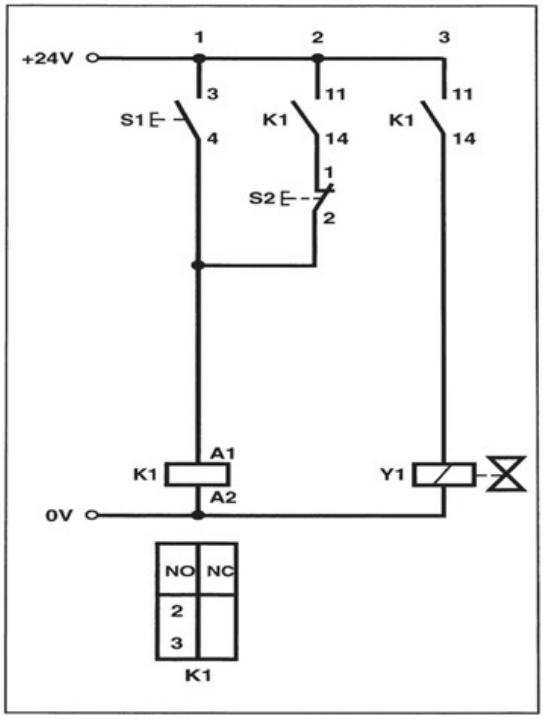
Name: **Enrolment No:**	

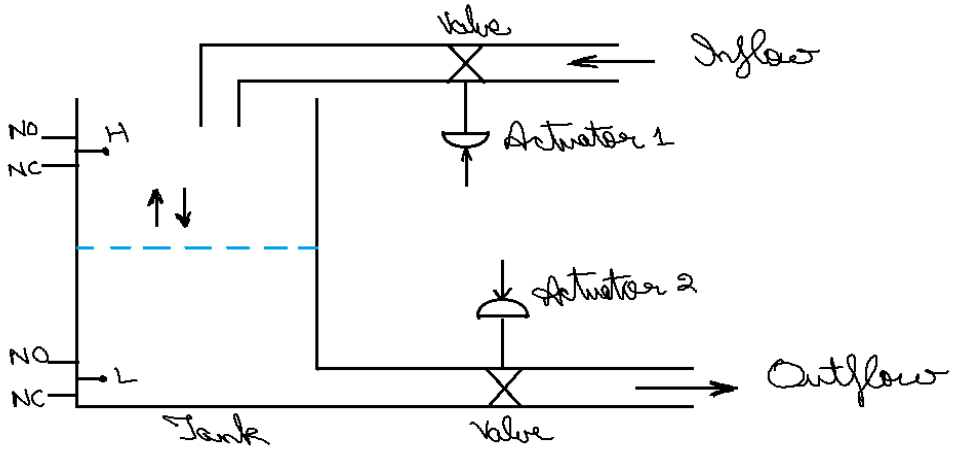
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2022

Programme Name: M.Tech. Automation and Robotics **Semester : II**
Course Name : Robotics based Industrial Automation **Time : 03 hrs**
Course Code : ECEG7018 **Max. Marks : 100**
Instructions: Assume any missing data.

SECTION A (20 marks)

S. No.		Marks	CO
Q 1	Describe flip flops.	4	CO1
Q 2	Describe the ladder logic circuit diagram shown in Fig. 1 given below.  Fig. 1: Ladder logic circuit	4	CO3
Q 3	Describe briefly the working of solenoid and contact relay.	4	CO1
Q 4	Discuss the various types of logic functions for combinational control with the help of diagrams and symbols.	4	CO1

Q 5	Discuss the various types of sequence control elements.	**4**	**CO2**
SECTION B (40 marks)			
Q 6	Using truth tables, prove the following Boolean algebra theorems. (i) $X + (Y . Z) = (X+Y) . (X+Z)$ (ii) $X . (Y+Z) = (X . Y) + (X . Z)$ (iii) $X . Y + X . \overline{Y} = X$ (iv) $(X + Y) . (X + \overline{Y}) = X$ (v) $(X . Y + \overline{X} . Z) = (X + Z) . (\overline{X} + Y)$	**10**	**CO2**
Q 7	Explain the construction and working of programmable logic circuits.	**10**	**CO3**
Q 8	Describe the working of gear drives. **OR** Classify the various types of belt drives.	**10**	**CO1**
Q 9	Explain the mechanical aspects of motor selection.	**10**	**CO1**
SECTION-C (40 marks)			
Q 10	A piston in a pneumatic cylinder starts moving on momentary application of an input signal. After the piston reaches its maximum displacement position, as indicated by a limit switch, it retracts to its original position and keeps on oscillating between the two extreme positions, till a stop signal is applied. Write the logic equations, draw logic diagram and control diagram, using pneumatic elements.	**20**	**CO4**
Q 11	Figure 2 shows a tank system which is filled with liquid by inflow through a solenoid actuated valve, till level H. The level is maintained at the above position for 1 minute and the tank then starts emptying till level L, through a solenoid actuated valve. The limit switches H and L have connections NO and NC available. In addition, an ON/OFF switch and an emergency push button are used. Draw relay ladder diagram for the above system, using suitable relays and their contacts.  Fig. 2: A tank system	**20**	**CO5**

	OR It is required to implant a proximity switch for a hydraulic system. Draw the hydraulic circuit diagram, ladder logic diagram, and express the governing equations for the same.		