UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Robotics Application **Semester: 8th**
Program: B.Tech Mechatronics
Subject Code:MEEL423
Time: 03 hrs. **Max. Marks: 100**

SECTION A
Attempt all the questions

| S. No.		Marks	CO
Q 1	1. Consider the following case and answer the question below it. A local chemical factory has 550 employees. Because of strong competition and economical reasons, the owner decides to fire 90 workers and install 10 robots. (a) Write your views on this proposal of the owner (b) Is it fair to fire the workers? (c) Is owner obliged to retain the workers and use them for other tasks? (d) If the chemicals in the factory are injurious to the workers and workers often have health problems, what will be your answers to above?	4	CO5
Q 2	Pick a small scale manufacture in your city. Study his manufacturing operations and carry out justification analysis for using robots in this industry.	4	CO4
Q 3	List the sequence of the activities performed by the robot to carry out the machine loading and unloading operation	4	CO4
Q 4	A prismatic object is moved around on a surface plate with one of its face in contact with the surface plate. Assuming the surface to be frictionless and rigid, identify the variables subjected to artificial constraints exists for variables not subjected to natural constraints.	4	CO3
Q 5	What are the checklist for evaluating robot applications	4	CO3
	SECTION B **Attempt all the questions**		
Q 6	Describe the robot control architecture for an n-DOF manipulator	10	CO4
Q 7	Determine the partitioned PD control law for the three axes SCARA manipulator shown in figure1.	10	CO1
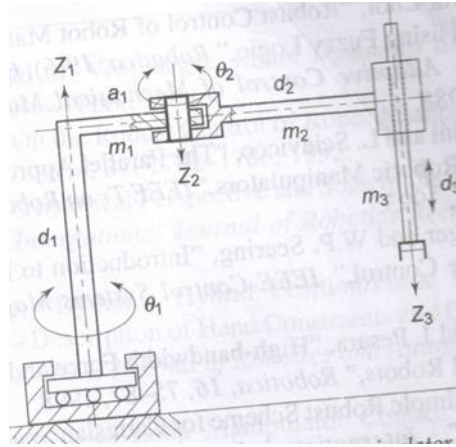
Figure1

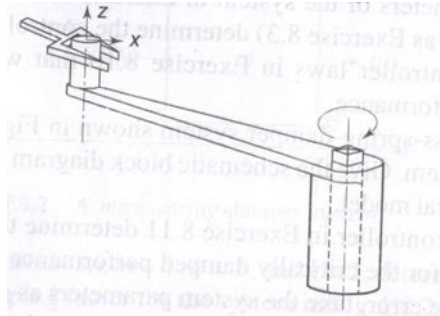| Q 8	The manipulator task for a manipulator is to use its end -effector to wind a mechanical clock. The winding task is equivalent to turning a crank as shown in figure2. Choose the appropriate constraint frame and identify all the natural and artificial constraints. Figure 2	10	CO2
Q 9	Consider the mass- spring damper system. A force f is applied to the mass to push it in the positive x-direction. Design a control system for regulating the position of mass, using a (a) Proportional derivative control strategy (b) Partitioned proportional derivative PPD control strategy Give the control system block diagram and the mathematical model for the control system. OR Explain adaptive control system for robot control scheme.	10	CO3

SECTION-C Attempt all the questions			
Q 10	Explain the steps are involved in assembly. How the active compliance and passive compliance are important in assembly	**20**	**CO4**
Q 11	Explain the control architecture for hybrid position/force control scheme OR Explain the computed torque control for n -DOF of manipulator.	**20**	**CO3**