

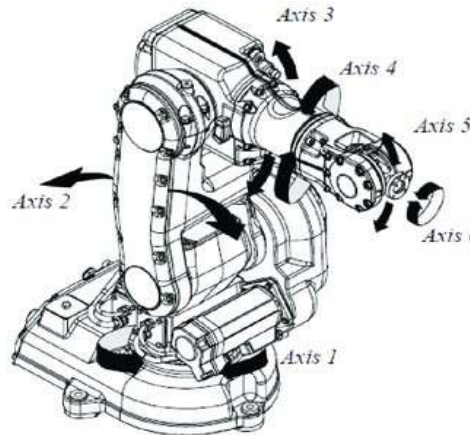
Due Date:  
June 5, 2020  
(16 Khordad 99)

In the name of god

**Advanced Robotics**  
Homework Assignment #6



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*IRB140 Robot*

IRB 140 specifications consist of mass, inertia matrix, length and etc. for all joints are mentioned in the attached file (named “IRB 140”)

- 1-First use Maple (or Matlab ) to obtain Dynamic equations for IRB 140 in configuration space.
  - 2-use equations in the file and calculate Dynamic equations in **Cartesian space** (these equations will be used for Force and Impedance control)
  - 3- use Dynamic equations to design a **PD controller** for desired trajectory (for both regulation and tracking)
  - 4- use Dynamic equations to design a **PD+ gravity** controller for desired trajectory (for both regulation and tracking)
  - 5- suppose there is not any uncertainty .use these equations and design a controller based on **Inverse Dynamic** method .check it with your arbitrary trajectory (sine wave and etc.)
  - 6- suppose arbitrary uncertainty . design a controller based on **Robust Inverse Dynamic** method . check it with your arbitrary trajectory (sine wave and etc.). you must explain your assumptions and controller design process completely in your report.
- modify this controller for **chattering avoidance** and compare control effort in both cases.

Good Luck!