

Roll No.

IL2203: Industrial Robotics

Time: 3 hours

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Assume suitable data wherever required and mention it.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow charts wherever required is an integral part of the answer.

Q.1A A humanoid robot is developed using four KUKA LBR 7-DOF individual (08)
modules, as shown in Figure 1. Evaluate the kinematic model of the humanoid
robot, i.e., the skeleton model and mark the frames for both the arms and legs.

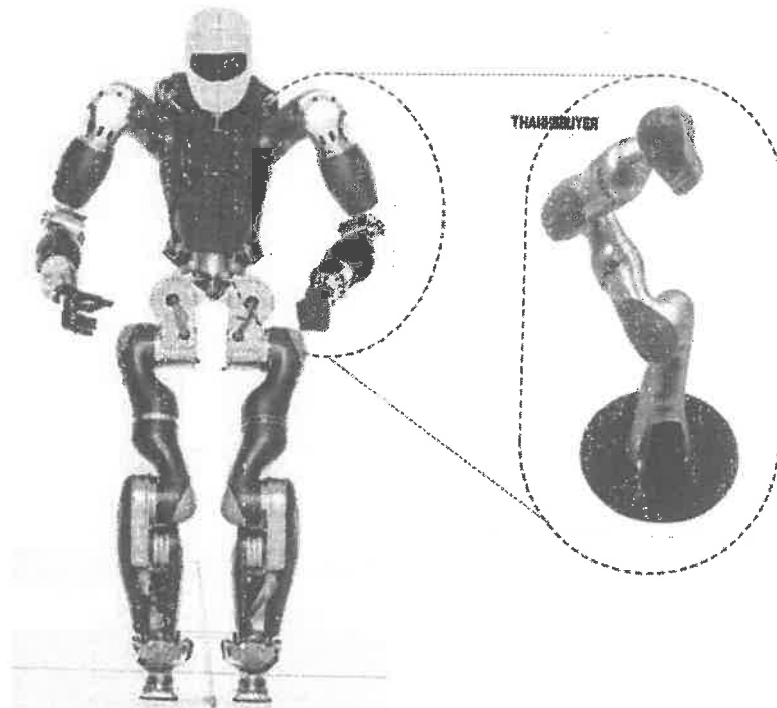


Figure 1. Humanoid Robot developed using KUKA LBR IIWA Robot

- Q.2A** The KUKA LBR IIWA Robot, as shown in Figure-1, is used in paper industries for (04)
binding operation. Determine the Denavit-Hartenberg parameters.
- Q.2B** Quadcopters are required to form patterns in the sky such that the identified (04)
trajectory is a sequence of motions as: translation (along X, Y, Z), Rotate (along Z)
and translation (along X). Determine the transformation matrix for these motion
sequences (using homogeneous transformation).
- Q.3** The KUKA LBR IIWA robot can be represented as a two DOF planar robot in a (08)
specific task. Develop a velocity and acceleration model for the system.
- Q.4A** Briefly explain all the necessary elements for a typical robot control system. (06)

- Q.4B A computer vision module is used to estimate the kinematic parameter of the robot. Design the procedure to estimate the kinematic of a 6-DOF robot. (02)
- Q.5 Evaluate the Dynamic model of the above reduced 2-DOF robot using Euler-Lagrange theory. Draw a neat sketch to show the skeleton model. (08)