

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY
End Term Examination, May 2022
PhD, Semester II

Roll No.....

Mechatronics (ME1404)

Time: 2 hours

Max. Marks: 40

Instructions to students:

Assume suitable data wherever required and mention it clearly.

Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

- Q.1 A robotic leg is developed as shown in figure 1. The mechanism has a timer-belt-based power transmission system. but due to misalignment between the two shafts of the system the power transmission failed, suggest an economic and easy power transmission installation. Draw, explain, and justify your comment. Develop a mathematical formulation for the power transmission element (in case it is a belt drive system then the length of drive system, velocity ratio, and torque relationship). (10 marks)
- CO4

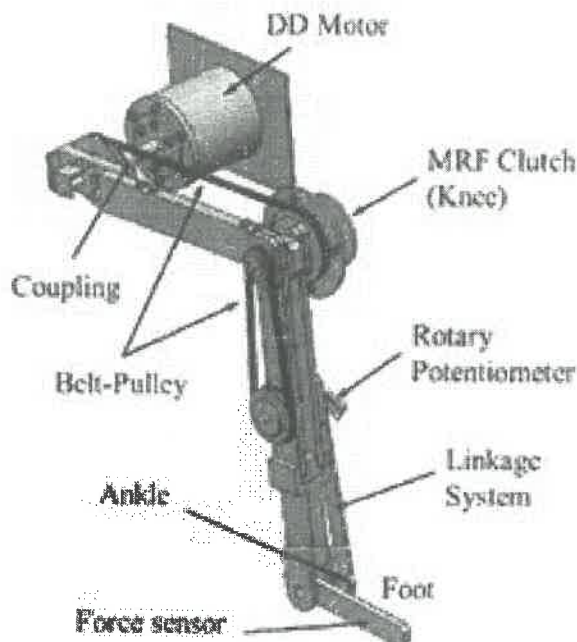


Figure 1: Robotic leg

- Q.2 For the robotic leg shown in figure 1, determine all kinds of sensors that will be opted to make the system work accurately apart from some listed in the figure. Draw a neat section view, construction, principle, and working of the identified sensors. (10 marks)
- CO1

- Q.3 For the robotic leg shown in figure 1, determine the control algorithm to make it hop on the floor. Explain the construction and working of inverting and difference operation using Op-amp. (4+3+3 marks)
CO3
- Q.4 Develop a close loop control model of a bread toaster as shown in figure 2 where the function is to automatically dispense the bread based on the user requirement. (2.5+2.5+2.5+2.5 marks)
A sensor is used to estimate the displacement of the tray (toaster tray). Determine a suitable kind of displacement sensor.
Identify the performance parameter for the sensor, and
Determine a suitable value for the parameters required for the application. CO1 & CO2

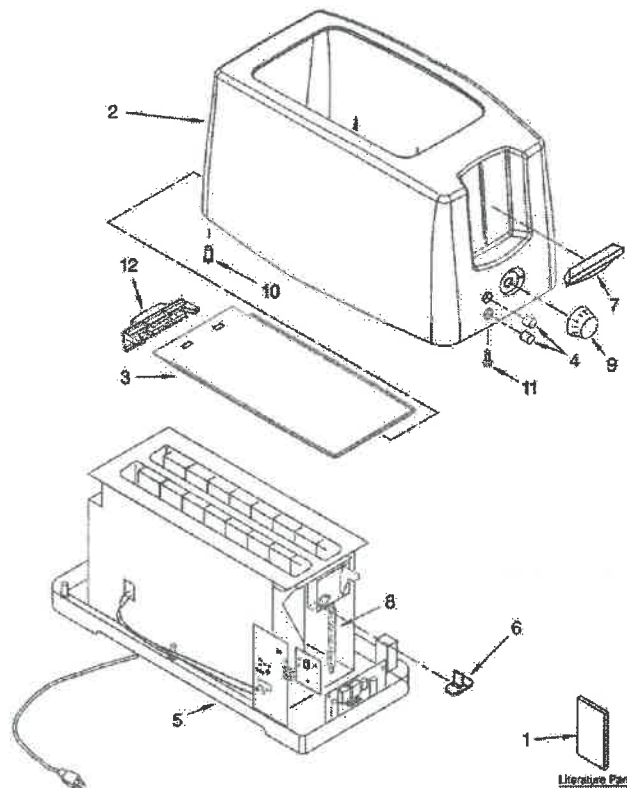


Figure 2: bread toaster