



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE : FAB 11202
SUBJECT TITLE : ROBOTICS FUNDAMENTAL
LEVEL : BACHELOR
DURATION : 8.00pm – 10.00pm
(2 HOURS)
DATE : 27 APRIL 2010

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of **TWO (2)** sections. Section A and B. Answer all questions in Section A. For Section B, answer two (2) question only.
 6. Answer all questions in English.
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THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**

- (a) Define industrial robot. (3 marks)
- (b) List down three laws of robotics invented by Asimov. (6 marks)
- (c) State three types of power source for robotics system. (3 marks)
- (d) Describe industrial robot work envelope. (3 marks)

Question 2

- (a) Explain the function of teach pendant in industrial robot systems. (4 marks)
- (b) State three basic structure of industrial robot controller. (3 marks)
- (c) State three technical features for robots selection. (3 marks)

Question 3

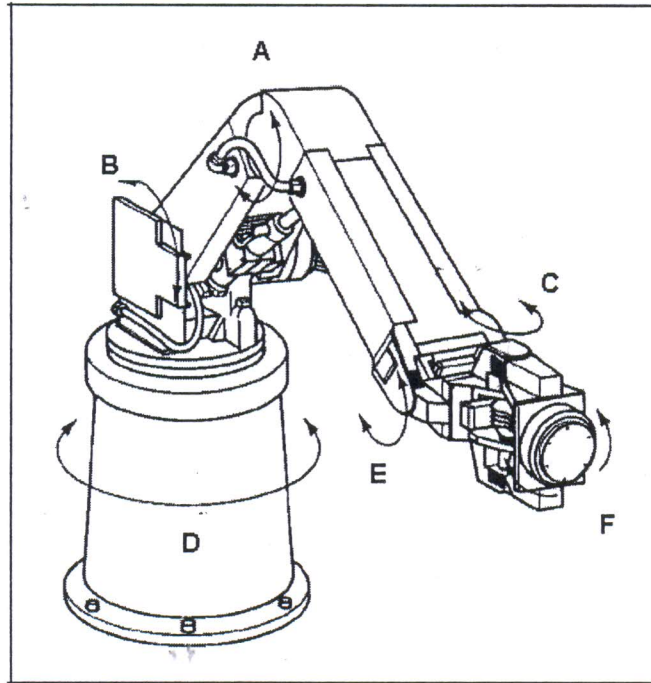


Figure 1: Robot Mechanical Arm

- (a) Label all components shown in Figure 1 (6 marks)
- (b) Describe accuracy in industrial robots. (3 marks)
- (c) Based on Figure 2, names all construction of joints in industrial robots. (6 marks)

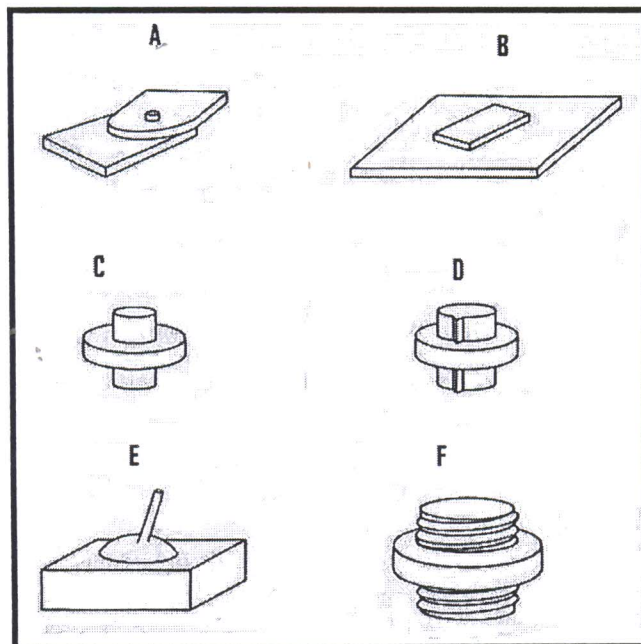


Figure 2: Construction of joint in industrial robots

SECTION B (Total: 60 marks)

INSTRUCTION: Answer only TWO (2) questions.
Please use the answer booklet provided.

Question 4

- (a) Explain the industrial robot arm configurations. (5 marks)

- (b) State arm configurations would be the most suitable for the systems in **Figure 3**: (6 marks)

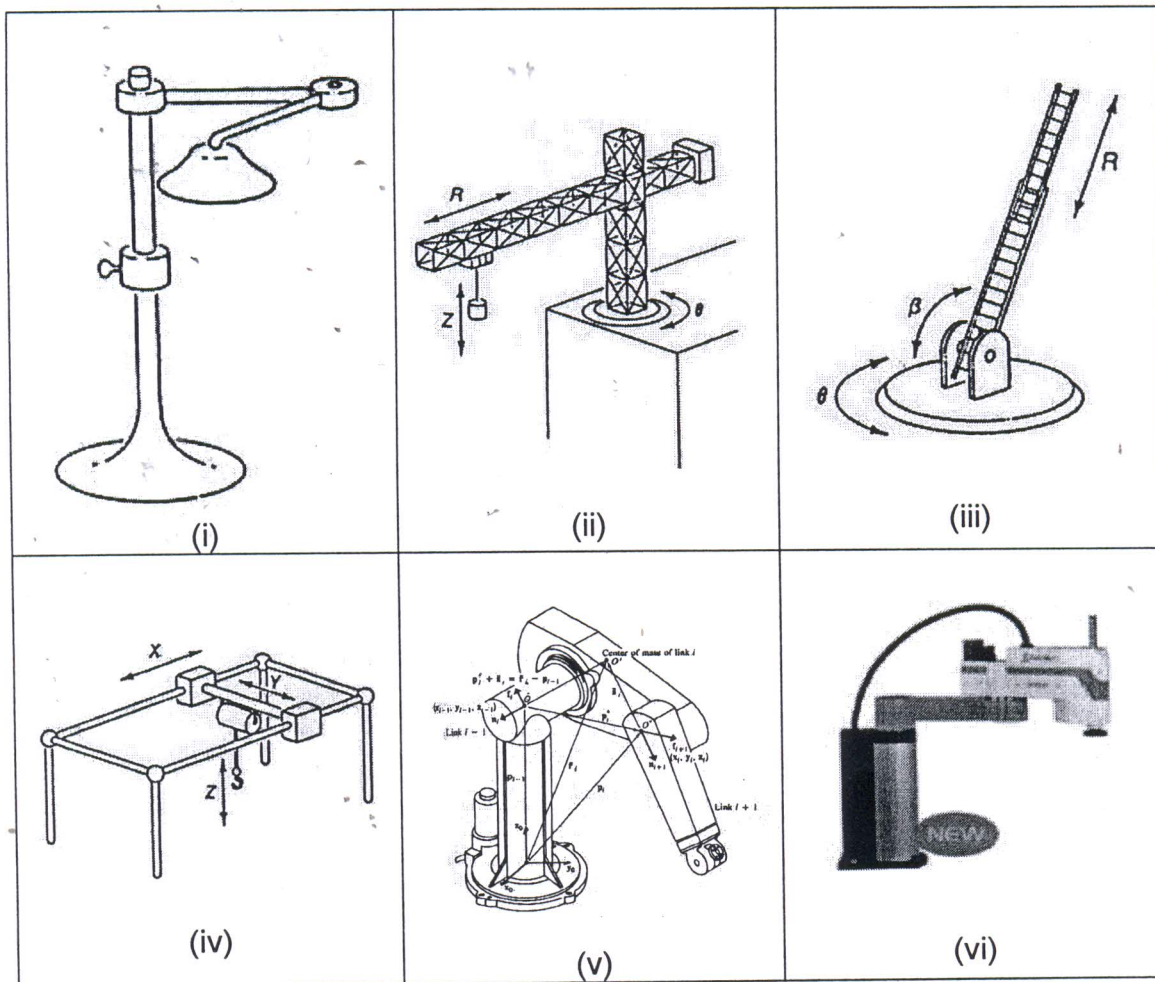


Figure 3: The type of robot configuration

- (c) Sketch the work envelope of a
- i. Cartesian robot (2 marks)
 - ii. SCARA robot (2 marks)
 - iii. Cylindrical robot (2 marks)
 - iv. Spherical robot (2 marks)
 - v. Revolute robot (2 marks)
- (d) State three classifications of robots by its field of application. (3 marks)
- (e) State the difference between low level technologies robot and high level technologies robot. (3 marks)
- (f) Explain first generation of industrial robot. (3 marks)

Question 5.

- (a) Explain the relationship between load capacity and speed of motion in industrial robots. (6 marks)
- (b) Describe the difference between closed-chain and open-chain arm robot. (3 marks)

(c) In spot welding, the repeatability and accuracy is important aspect to have a quality welding works. Based on **Figure 4**, you are required to:

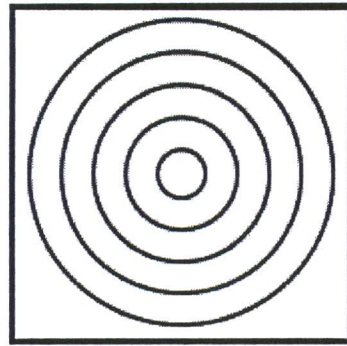


Figure 4: The diagram of repeatability and accuracy of spot welding robot.

- i. Draw the condition of poor accuracy and poor repeatability. (1 mark)
 - ii. Draw the condition of poor accuracy and good repeatability. (1 mark)
 - iii. Draw the condition of good accuracy and poor repeatability. (1 mark)
 - iv. Draw the condition of good accuracy and good repeatability. (1 mark)
- (d) Describe the operation involved in spot welding robot. (6 marks)
- (e) State four basic components of a spot welding robot. (4 marks)
- (f) Based on **Figure 5**, design a flow chart diagram for trajectory programming of the spot welding robot. (7 marks)

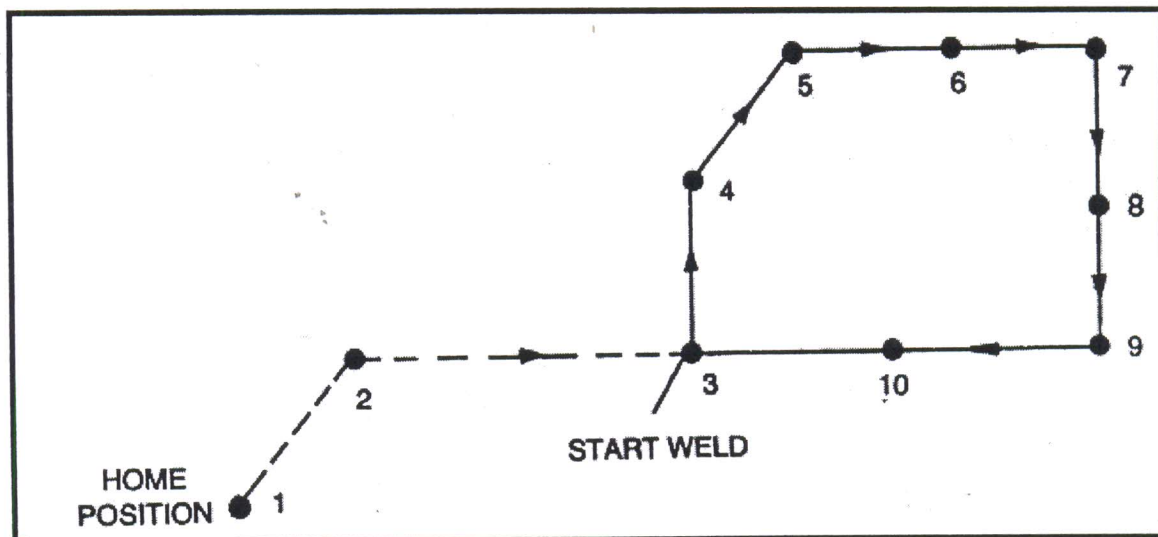


Figure 5: Trajectory for spot welding robot

Question 6

- (a) Describe the electrical drive system in robot. (3 marks)
- (b) State two robot programming languages classification. (4 marks)
- (c) Describe online and offline programming. (5 marks)
- (d) State four levels of programming languages. (4 marks)
- (e) Based on **Figure 6**, describe the role of the robot. (3 marks)

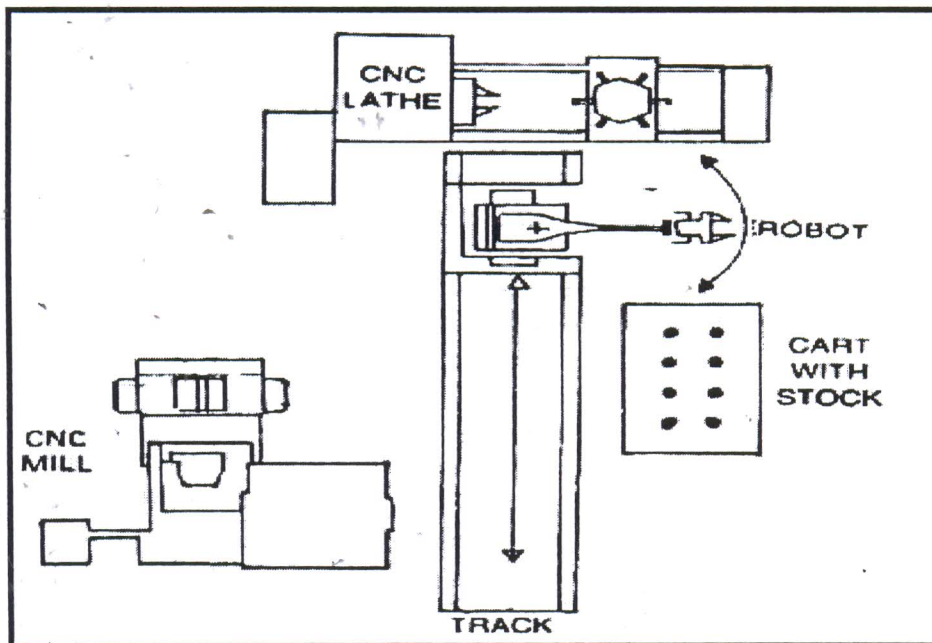


Figure 6: Machining cell layout from top view.

- (f) List at least 2 safety requirements for robotic application in **Figure 6**. (4 marks)

- (g) During production hours, state the authorization to enter each of the zones (zone 1, 2, and 3) indicated in the **Figure 7** below. (3 marks)
- (h) Explain the consequence which may happen for the maintenance personnel who entered zone 3. (4 marks)

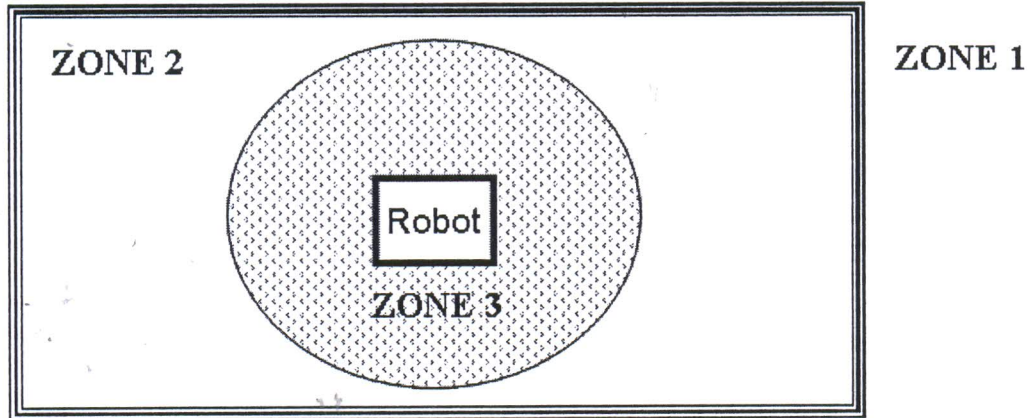


Figure 7: Work Cell Zone

END OF QUESTION