Document No : UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPT 2013 SESSION

SUBJECT CODE	**: FAD 20302**
SUBJECT TITLE	**: INTRODUCTION TO ROBOTICS**
LEVEL	**: DIPLOMA**
TIME / DURATION	**: (2 HOURS)**
DATE	**:**

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) questions only.**
6. **Answer all questions in English.**

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) Robots are considered to be a key element in automated manufacturing.

(i) Define an industrial robot term referring to Robotic Industries Association's (RIA).

(4 marks)

(ii) List ***three (3)*** laws of robotics

(6 marks)

(b) Robotics terminology consists of several elements. List ***five (5)*** of these elements and explain these components and their purpose.

(10 marks)

Question 2

(a) End effectors are devices attached to wrist of a manipulator. List ***six* (6)** end effectors commonly found in industry.

(6 marks)

(b) Illustrates ***four (4)*** relationships between accuracy and repeatability for industrial robot.

(8 marks)

(c) Compare the ***three (3)*** types of drive power sources by *preparing a table* to illustrates the strengths and weakness of each of it.

(6 marks)

Question 3

(a) List ***seven (7)*** major production applications of robots and determine the most common application in robotics industry.

(8 marks)

(b) One method of classifying a robot is by the geometric configuration of its work envelope. List a ***four (4)*** major configuration of industrial robot manipulator.

(4 marks)

(c) Describe ***two (2)*** advantages of revolute/articulated configuration over other three configurations

(4 marks)

(d) The Cartesian robots commonly used for pick and place work. Sketch the Cartesian robot configuration and its work envelop.

(4 marks)

SECTION B (Total: 40 marks)

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

Question 4

(a) Sensor is the most important element to be added when developing the industrial robot. List ***two (2)*** advantages of sensor and name ***four (4)*** types of sensors and its application.

(12 marks)

(b) Sketch the position and Orientation of Robot TCP Frame relative to robot base Frame of:-

I. Position: X=1000, Y=100, Z=750. Orientation: Roll= 90, Pitch= 0, Yaw= 0

(2 marks)

II. Position: X=1000, Y=100 Z=1000. Orientation: Roll= 90, Pitch= 90, Yaw= 0

(2 marks)

III. Position: X=1000, Y= -100, Z=1000. Orientation: Roll= 90, Pitch= 90, Yaw= 90

(2 marks)

IV. Position: X=1000, Y= -100, Z=750. Orientation: Roll= - 90, Pitch= 90, Yaw= 90

(2 marks)

Question 5

(a) Using the notation scheme for defining manipulator configurations in ***Table 1 in page 6***. Sketch a robot manipulator for following notation;

(i) LRL (5 marks)

(ii) RRL (5 marks)

(iii) TRL (5 marks)

(iv) LVL (5 marks)

Question 6

(a) Determine the ***six (6)*** factors that must be considered when selecting a robot to perform an industrial task.

(6 marks)

(b) List ***four (4)*** major configurations in industrial robot and give ***one (1)*** advantage and disadvantage of each configuration.

(10 marks)

(c) Referring to the **Figure 1**, illustrates the work envelope of this robot.

(4 marks)

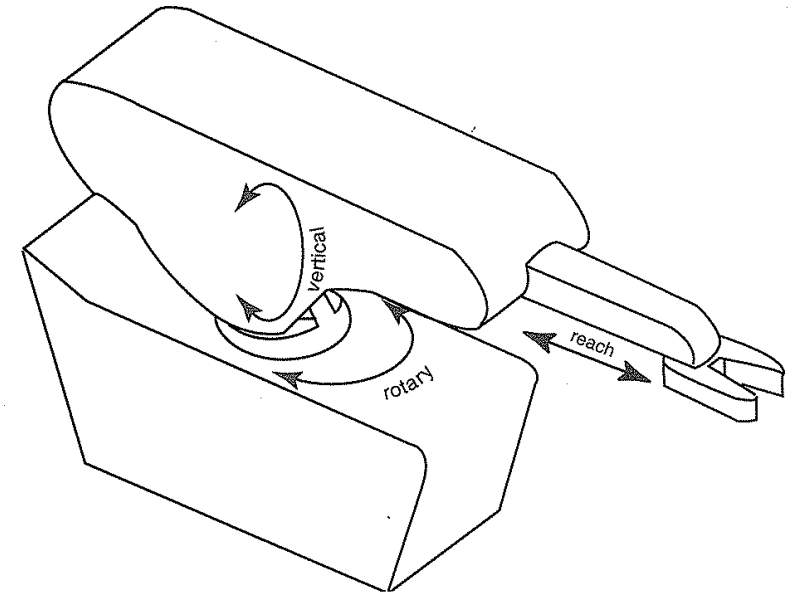
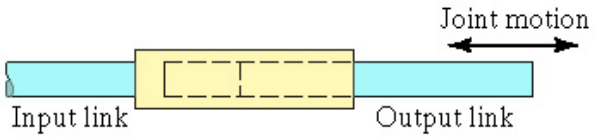
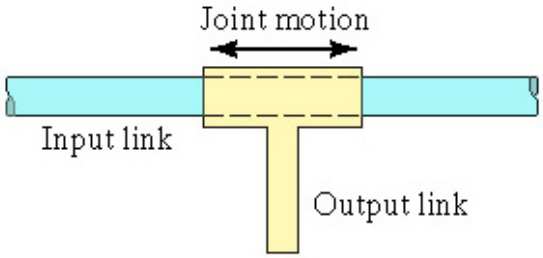
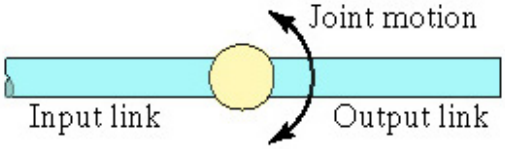
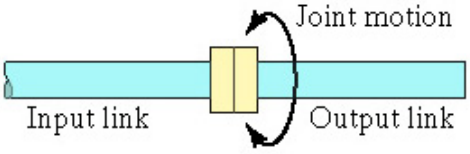
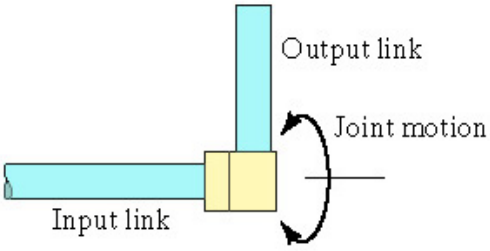


Figure 1: The Spherical Robot.

Table 1: The Notation Scheme for Defining Manipulator Configurations

Notation	Diagram
Linear joint (type L)	
Orthogonal joint (type O)	
Rotational joint (type R)	
Twisting joint (type T)	
Revolving joint (type V)	

END OF QUESTION