

AMERICAN UNIVERSITY OF BEIRUT
DEPARTMENT OF ENGLISH

ENGLISH 206
FINAL EXAM
SUMMER 2001

*Same as Final
Exam 2001*

Name: _____

Instructor: _____

Time: 2 Hours 45 Minutes

Section: _____

TEXT A

Kinematics: A Subsystem of Industrial Robots

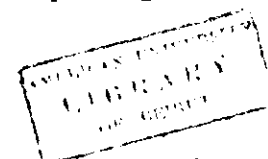
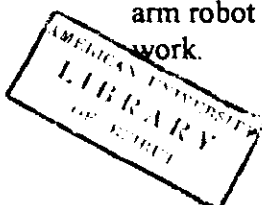
Kinematics refer to the spatial arrangement, according to the sequence and structure, of the axes of movement in relation to each other. There are four basic types of movement that an industrial robot may have: (1) Cartesian, (2) cylindrical, (3) polar, and (4) jointed-arm.

Cartesian Co-Ordinate Robot. The Cartesian co-ordinate robot is one that consists of a column and an arm. It is sometimes called an x-y-z robot, indicating the axes of motion. The x-axis is lateral motion, the y-axis is longitudinal motion, and the z-axis is vertical motion. Thus, the arm can move up and down on the z-axis; the arm can slide along its base on the x-axis; and then it can telescope to move to and from the work area on the y-axis. The Cartesian co-ordinate robot was developed mainly for arc welding, but it is also suited for many other assembly operations.

Cylindrical Co-Ordinate Robot. The cylindrical co-ordinate robot is a variation of the Cartesian robot. This robot consists of a base and a column, but the column is able to rotate. It also carries an extending arm that can move up and down on the column to provide more freedom of movement. The cylindrical co-ordinate robot is designed for handling machine tools and assembly.

Polar Co-Ordinate Robot. The polar co-ordinate, or spherical co-ordinate robot consists of a rotary base, an elevation pivot, and a telescoping extend-and-retract boom axis. These robots operate according to spherical co-ordinates and offer greater flexibility. They are used particularly in spot welding.

Jointed-Arm Robot. The jointed-arm robot resembles a human arm. It usually stands on a base on which it can rotate, while it can articulate at the "shoulder" joint, which is just above the base. The robot can also rotate about its "elbow" and "wrist" joints. With the swiveling and bending at the wrist, six degrees of freedom can be obtained. The jointed-arm robot is the most popular form for a robot and is capable in welding and painting work.



Text B

Improving Industrial Efficiency Through Robotics

1. Robots, becoming an increasingly **prevalent adjunct** in factories and industrial plants throughout the developed world, are programmed and engineered mechanical manipulators designed to perform industrial tasks without human **intervention**.
2. Most of today's robots are employed in the automotive industry, where they are **programmed** to take over such **assembly line** operations as welding and **spray** painting automobile and truck bodies. They also load and unload hot, heavy metal forms used in machines **casting** auto and truck frames. In addition, they install bulbs in instrument panels.
3. Robots, already taking over human tasks in the automotive field, are beginning to be seen, although to a lesser degree, in other industries as well. There they build electric motors, small **appliances**, typewriters, pocket calculators, and even watches. The robots used in nuclear power plants **handle** the radioactive materials, **sparing** human personnel **exposure** to radiation. These are the robots responsible for the reduction in job-related injuries in this new industry.
4. What makes a robot a robot and not just another kind of automatic machine? Robots differ from automatic machines in that after completion of one specific task, they can be reprogrammed by a computer to do another one. As an example, a robot doing spot welding one month can be reprogrammed and switched to spray painting the next. Automatic machines, on the other hand, are less **versatile**; they are built to perform only one task. Robots are more flexible and adaptable and usually more transportable than other machines.

Robots See, Touch, and Think

5. State-of-the-art robots, basically jointed-arm robots, are able to see objects, have a sense of touch, and make critical decisions. Although these robots are more expensive than other types, they remain relatively cheap considering their specifications. One such model developed by SensAble Technologies Inc. comes to under US \$ 20,000. Engineers skilled in microelectronics and computer technology are developing artificial vision of robots. With the ability to "see," robots can identify and inspect one specific class of objects out of a **stack** of different kinds of materials. One robot vision system uses electronic **digital** cameras containing many rows of light-sensitive materials. When light from an object such as a machine part strikes the camera, the sensitive materials measure the intensity of light and convert the light rays into a range of numbers. The

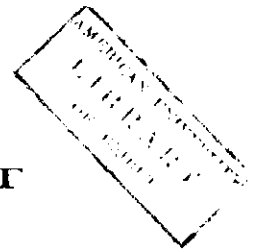
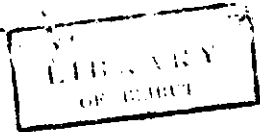
numbers are part of a gray-scale system in which brightness is measured in a range of values. One scale ranges from 0 to 15, and another from 0 to 255. The 0 is represented by black. The highest number is white. The numbers in **between** represent different shades of gray. The computer then makes the calculations and converts the numbers into a picture that shows an image of the object in question. It is not yet known whether robots will one day have vision as good as human vision. Technicians believe they will, but only after years of development.

6. Engineers working on other advances are designing and experimenting with new types of **articulated** metal hands and fingers, giving robots a sense of touch. Other engineers are writing new programs allowing robots to make decisions such as whether to **discard defective** parts in finished products. To do this, the robot also has to be capable of identifying those defective parts.
7. These robots, **assembled** with a sense of touch and the ability to see and make decisions, will have plenty of work to do. They can be used to prospect for minerals on the ocean floor or in deep areas of mines too dangerous for humans to enter. They will work as gas station attendants, firefighters, housekeepers, and security personnel.

Text A: Adapted from: McMurrey, D. (1999). Technical Research Associates, Inc. [On-line] Available:

[Http://www.io.com/~hcexres/tcm1603/achtml/class_ex.html](http://www.io.com/~hcexres/tcm1603/achtml/class_ex.html)

Text B: Adapted from: Saslow, J.M., & Mongillo, J.F. (1985). English in context: Reading comprehension for science and technology. Englewood Cliffs, N.J.: Prentice-Hall.



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1. Quote the formal definition presented in the first section of text B. Label each one of its parts. (6 pts.)

Part I _____ Label _____

Part II _____ Label _____

Part III _____ Label _____

2. A. Circle the correct answer. (2 pts.)

Text A is a(n)

- a. description of a mechanism.
- b. extended definition.
- c. classification.
- d. process description.

- B. Briefly explain and justify your answer. (3 pts.)

3. A. Circle the correct answer. (2 pts.)

Text B is a(n)

- a. partition.
- b. cause/effect.
- c. extended definition.
- d. process description.

- B. Briefly explain and justify your answer. (3 pts.)



4. You are an industrial engineer responsible for operations at a car manufacturing plant. In your last meeting with other company executives, you were assigned the task of purchasing two new robots to replace two old automatic machines. These two robots should perform handling machine tools, assembly, welding, and painting work. You contacted three robot manufacturers (you are free to give names and locations) and you received the information presented in texts A and B. Using the information in the two texts selectively and supplying any other needed details from your common knowledge, write a feasibility report to explain your decision as to which particular robots you should purchase.
- Address your report to the committee of executives.
 - Use the report format that is appropriate for this particular situation.
 - Write your report on pages 3 &4, paying special attention to layout and design. (22 pts.)

5. **SensAble Technologies Inc.** is advertising the position of an industrial engineer who should be able to supervise the production and assembly of state-of-the-art robots (see text B). The ad requires the applicant to have some background in robotics, microelectronics, and computer technology. No previous experience is required as the selected applicant will have to undergo a period of initial training. Highlighting your academic background and the related courses you took at AUB, write an employment letter in which you apply to such a position.

- Address your letter to **SensAble Technologies Inc.**
 Woburn, Massachusetts
 USA
- Use your AUB address.
- Write the letter on page 6, paying special attention to layout and design. (22 pts.)

6. A contrast analysis i.e., an analysis of differences, can be organized by either of two organizational patterns. Name each organizational pattern. Then label the text and cite the paragraph/s which include/s an example of this pattern.

A. a. Organizational pattern I: _____ (1 pt.)

b. Example in text _____

Paragraph/s _____ (1 pt.)

B. a. Organizational pattern II: _____ (1 pt.)

b. Example in text _____

Paragraph/s _____ (1 pt.)

7. Complete the following statements:

A. A summary must agree with the original material in two ways:

a. _____

(2 pts.)

b. _____

(2 pts.)

B. When planning a written or an oral presentation, you should first consider

a. _____

(2 pts.)

b. _____

(2 pts.)

8. Write an abstract for text B. (6 pts.)

9. Circle the incorrect answers. (3 pts.)

Conciseness necessitates

- a. being brief.
- b. saying much in a few words.
- c. omitting nonessential words.
- d. using simple words and direct word patterns.
- e. combining sentence elements.
- f. using brief sentences and avoiding long complex ones.
- g. making every word count.

10. List the most typical ways of allowing for plenty of white space on a page in order to enhance layout.

a. _____

(1 pt.)

b. _____

(1 pt.)

c. _____

(1 pt.)

11. Explain the difference between classification and partition. (4 pts.)

12. To make the most effective use of visuals in a written or an oral presentation, several conditions must be met when preparing these visuals. List three of them.

a. _____

(2 pts.)

b. _____

(2 pts.)

c. _____

(2 pts.)

13. Enumerate the three most important ways in which you can prepare yourself for a job interview.

a. _____

(2 pts.)

b. _____

(2 pts.)

c. _____

(2 pts.)

14. Drawing on information from the Texts,
Prepare a bid specification for a jointed-arm
robot. (5 pt.)