



COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturer : Dr Ahmed El-Shenawy

Course : Robotics

Course Code : EE 514

Marks : 40

Date : 16/1/2014

Time : 2 hour

Final Exam

Answer all the following questions

Question (1) (A.1, A.4, B.1) : (8 marks)

Consider the robot represented symbolically by Fig. 1 Find an expression for the forward Kinematics relation.

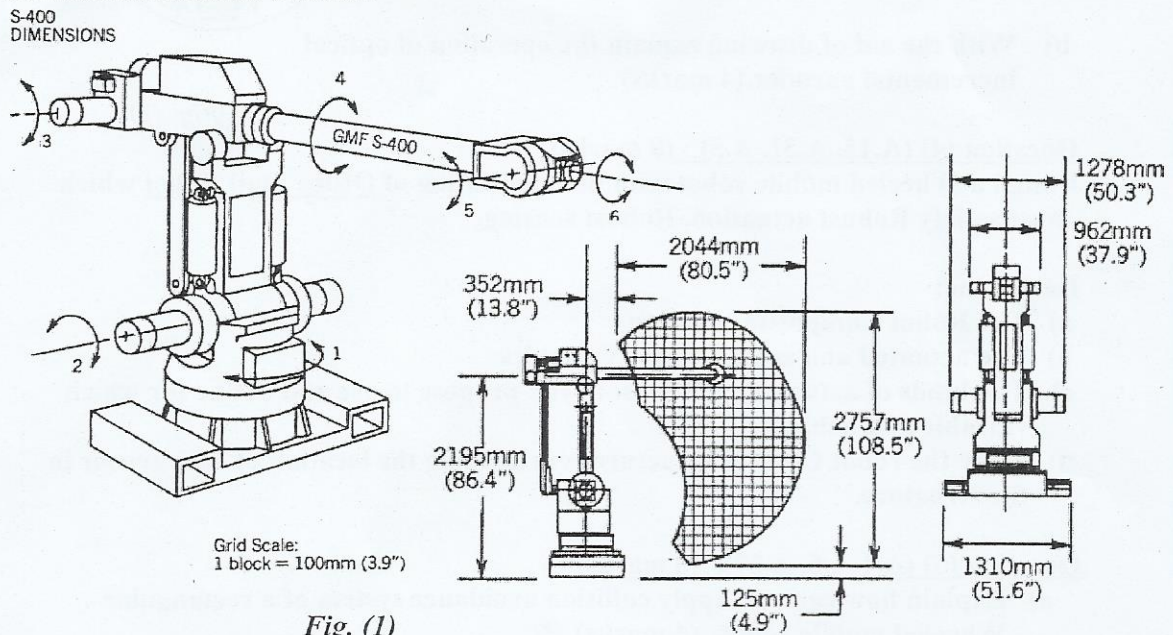


Fig. (1)

Question (2) (A.15): (8 marks)

a) What are the differences between sensitivity and cross sensitivity? And state the types of sensors. (4 marks)

b) State whether the following statements are TRUE or FALSE and WHY (4 marks)

i) Autonomy is the set of all possible time-trajectories of system variables.

TRUE FALSE

ii) One of the main advantages of servo mechanism that it can operate in four quadrant of servo motor.

TRUE FALSE

Members of course Examination Committee:	Signature:	Date:
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Head of Department: Prof.Dr. Hamdy Ashour		5/1/2014

Question (3)(A.15, B.1, B.3): (8 marks)

a) For the robot configuration shown in Fig. 2;
Check: (4 marks)

- i. the mobility of the robot,
- ii. the actuation scheme,
- iii. the sensing scheme
- iv. if needed what are the required actions to yield the robot to robust actuation and robust sensing (Show how)

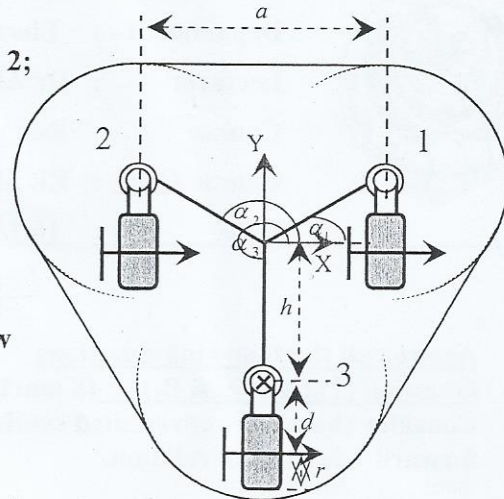


Fig. (2)

b) With the aid of drawing explain the operation of optical incremental encoder.(4 marks)

Question (4) (A.15, A.31, A.5) : (8 marks)

Design a Wheeled mobile robot with the application of Office Mail Robot which must satisfy Robust actuation, Robust sensing,

Determine:

- a) The Robot Composite equation
- b) The actuated and sensed wheel Variables
- c) The kinds of actuators and sensors you propose to use and define for which variable and behavior.
- d) Show the robot Control Structure representing the location of each sensor in the structure.

Question (5) (A.1,A.5, A.27): (8 marks)

- a) Explain how can you apply collision avoidance system of a rectangular Wheeled mobile robot. (4 marks)
- b) Explain the Reset-wind up Problem of PID Controller, and how can it be solved. (4 marks)

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