Test 2 solution EE520

Q1

<u>Add a 3 stage cascade PI controller diagram.</u>

- D control is use to control the changing dynamics

- However, the control block forward already take care of this

- For the position control block, the block in front is the velocity control block

- For the velocity control block, the block in front is the force (current) block.
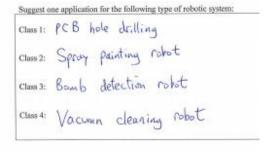
Q2

<u>Add STR and MRAC diagrams, including labels of major signals.</u>

(d) Comparison between MRAC and STR	
MRAC	**STR**
Better all-round performance	Only targets specific improvements
Real time simulation of the whole servo loop	Simulation of the motor & mechanics only
Mathematically complicated	Less complicated. Use less computing power
Targets for high end systems	Targets for mass volume products
For lower speed applications	For fast applications (e.g. laser focusing)

Q3

		Is the work space free from obstacles?	
		Yes	No
Must the hand follow the specified path?	No	Class 1. Positional Control Problem	Class 4. Positional Control Plus On-line Collision Avoidance Travelling
	Yes	Class 2. Path Tracking Problem	Class 3. Off-line Collision-free Path Planning Plus On-line Path Tracking

Suggest one application for the following type of robotic system:

Class 1: PCB hole drilling

Class 2: Spray painting robot

Class 3: Bomb detection robot

Class 4: Vacuum cleaning robot

Q4

(a)

EMI: unwanted signal spectrum emitted from the target, which may affect another device

EMC: the ability to withstand interference from another device, and still operate normally

(b)

PCB design: 1. Avoid big power line loops. 2. Positive and ground lines must not be too thin and long

3. add filter capacitors throughout the whole PCB 4. Run power and ground traces as close as possible

4. Separate out the high-power section / sensitive signal section / digital circuits / analogue circuits

5. on multi-layer boards, sandwich the horizontal lines and vertical lines between the power plane and the ground plane.

(c)

SOURCES FOR TESTING SUSCEPTIBILITY

1. CHATTERING RELAY WITH 15 CM ANTENNA

15 CM WIRE

. ELECTRIC APPLIANCE WITH BRUSH TYPE MOTOR, ESPECIALLY GOOD FOR CONDUCTED EMI (i.e. SHAVER, ELECTRIC DRILL)

3. IGNITION COIL

SPARK GAP