



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2011 SESSION

SUBJECT CODE : FAD10003
SUBJECT TITLE : AUTOMATION TECHNOLOGY
LEVEL : DIPLOMA
TIME / DURATION : 9.00am – 11.00
(2 HOURS)
DATE : 12 MAY 2011

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.

THERE ARE 8 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.

Please answers all in answer booklet provided.

Question 1

- (a) Define Mechanization (2 marks)
- (b) State and draw **three (3)** types of output signal produced by sensor. (3 marks)
- (c) List **five (5)** basic elements of feedback control system (5 marks)
- (d) Limit switch is widely used in industrial control devices and consumer electronic products. State **two (2)** advantages of using limit switch. (2 marks)
- (e) State the name for the following symbol in **Figure 1**. (8 marks)

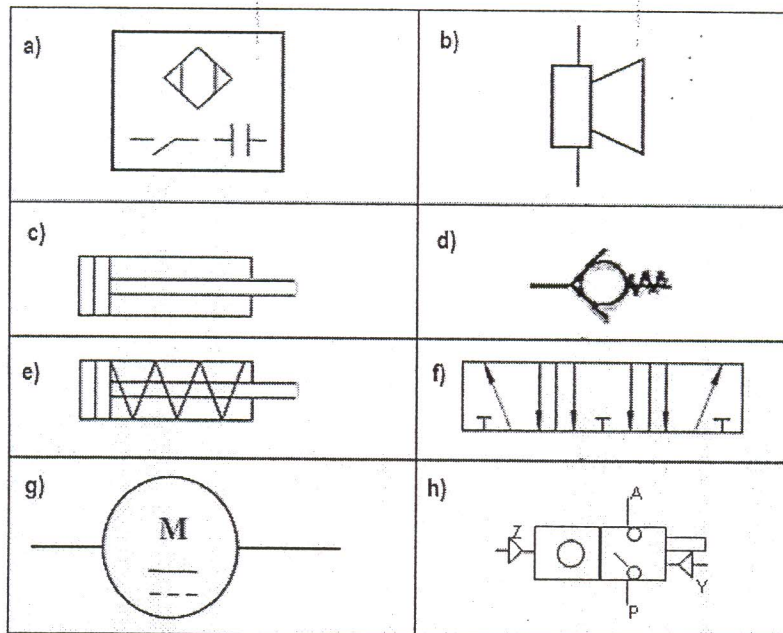


Figure 1: Symbol

Question 2

- (a) **Figure 2** shows the composition of proximity sensor
- i. Name the element in block 1, 2, and 3. Explain the function for each block (6 marks)
 - ii. State two types sensing element in block 4 that are normally used in proximity sensor application (2 marks)

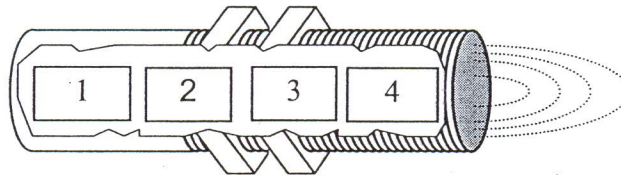


Figure 2: Composition of proximity sensor

- (b) The most commonly used actuator for generating linear motion is the pneumatic cylinder. Name **two (2)** types of pneumatic cylinder. (2 marks)
- (c) State a difference between sliding vane and swivel motor. (4 marks)

Question 3

- (a) **Figure 3** shows a non inverting amplifier. Given input voltage, $V_{in} = 2V$ and output voltage, $V_{out} = 12V$. Calculate the resistance value of **R1**, when $R2 = 500k\Omega$ (5 marks)

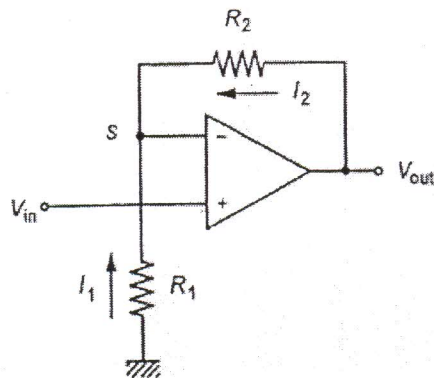


Figure 3: Non Inverting Amplifier

- (b) Determine the resistance of a platinum RTD at $80^{\circ}C$ if the resistance at $20^{\circ}C$ is 145.5Ω and if $\alpha (20^{\circ}C) = 0.00392$ (2 marks)

- (c) State **one (1)** type of sensor that could be used to measure each of the following:
- i. Flow rate of liquid
 - ii. Pressure
 - iii. Temperature
- (3 marks)

Question 4

- (a) State an advantage of using Programmable Logic Controller (PLC) compared to Electromechanical Control?
- (2 marks)
- (b) Draw an electrical circuit using **two push buttons** and **one relay** to show the **AND** logic function
- (4 marks)
- (c) Select the most suitable sensor for applications in **Figure 4**.
- (4 marks)

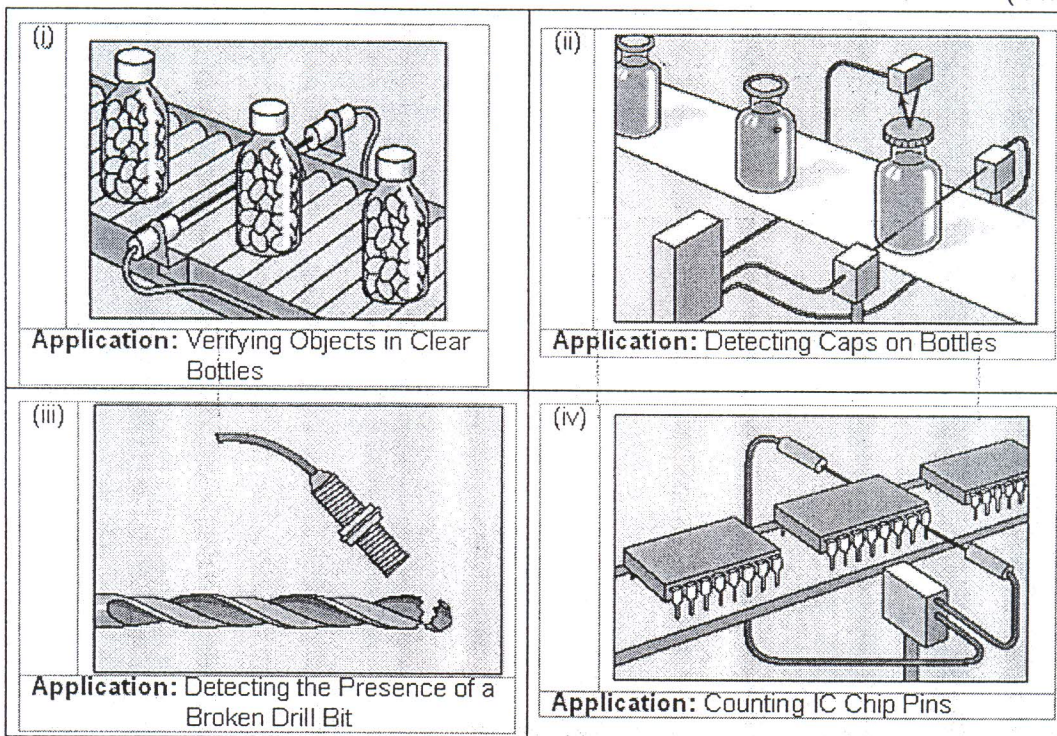


Figure 4: Sensor Applications

- (d) Element A takes the temperature signal and transforms it to resistance signal, element B transform the resistance signals into current signal, and element C transform the current signal into a display movement of a pointer across a scale. Identify element A, B, and C. Illustrate your answer using a block diagram
- (6 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please answers all in answer booklet provided.

Question 4

- (a) **Figure 5** is the approximate reduction factor for target material
- i. Calculate the actual sensing distance for all the three materials A, B and C in **Table 2** for a proximity sensor with sensing distance, $S_n = 12\text{mm}$ (6 marks)
 - ii. State a reason why material C has better sensing distance compared to material A and B. (2 marks)
 - iii. Correction Factor can be applied when the targets are smaller than the standard target size. Find S_a for a shielded type proximity sensor with sensing distance $S_n=12\text{mm}$ if the target size is half the size of sensor diameter. (3 marks)

Table 2: Target Material Data

Material (Brass)	Target Size
A	24mm x 24mm x 0.5mm
B	24mm x 24mm x 1.5mm
C	24mm x 24mm x 0.25mm

Table 3: Target Size Correction Factor

Size of Target Compared to Standard Target	Correction Factor	
	Shielded	Unshielded
25%	0.56	0.50
50%	0.83	0.73
75%	0.92	0.90

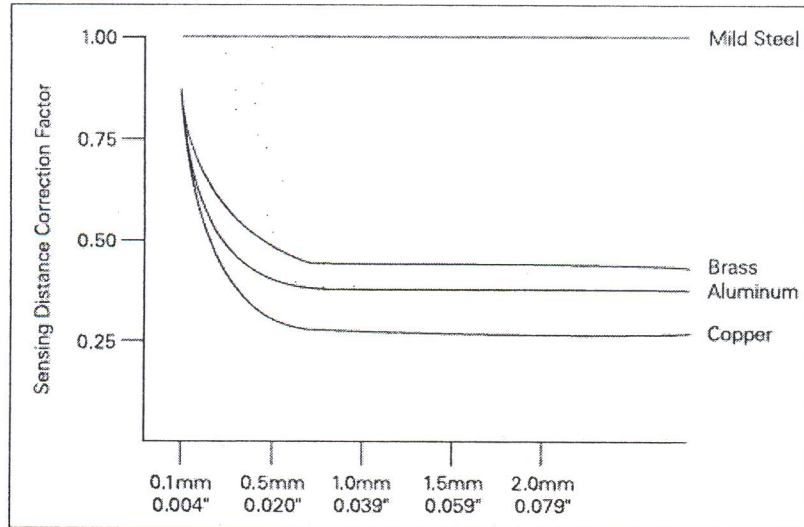


Figure 5: Target Thickness Reduction Factor

(b) Figure 6 show a 4/2 Way valve pneumatic pre-actuator. Based on this figure answer the following questions

- i. Define pneumatic pre-actuator (2 marks)
- ii. Briefly explain the operation of a 4/2 way valve (3 marks)
- iii. Draw the symbol (2 marks)
- iv. State any two (2) categories of pneumatic pre-actuator (2 marks)

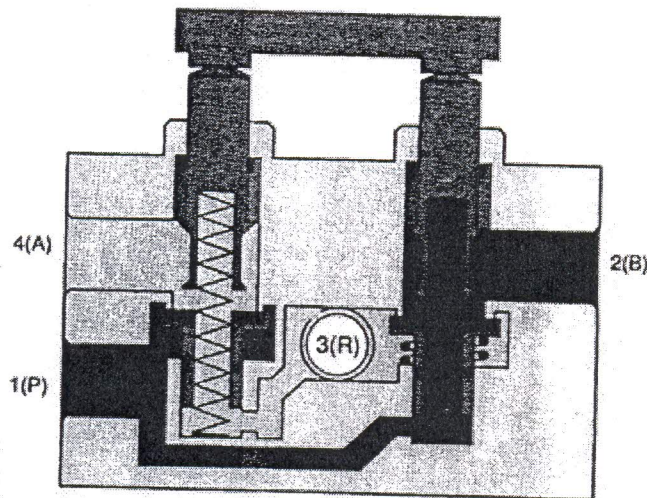


Figure 6: 4/2 Way Valve

Question 5

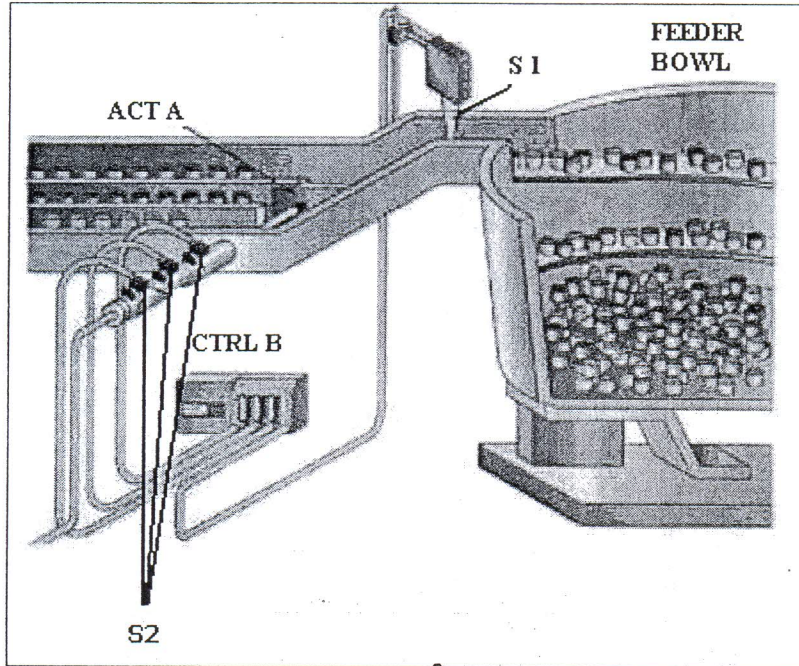


Figure 7: Feed Track Part Sorting System

System Operation

This feeder system in **Figure 7**, sorts parts into separate feed lines based on their color. Random parts travel up from the feeder bowl and pass in front of sensor, **S1**. The color sensor has three individual outputs that have been taught the product colors. The sensor signals the product color to the controller, **CTRLB** by activating the appropriate output. The **CTRLB** then signals the escapement, **ACT1** to feed the part down the correct feed line. Sensor, **S2** inform that the escapement is in the correct feed line position.

- (a) Select a suitable sensors, processor, and actuator that can be used in this system (4 marks)
- (b) Describe your system how its works (use block diagram to illustrate your explanation) (6 marks)

(c) The concept of Flexible Manufacturing System (FMS) is applicable to a variety of manufacturing operations and most widely applied in machining operations.

- i. Briefly explain **two (2)** capabilities that a manufacturing system must possess to be flexible?
- ii. State **four (4)** basic components of typical FMS
- iii. List **two (2)** advantages of FMS implementation
- iv. Explain an advantage of using Automated Guided Vehicle (AGV) compared to system conveyor

(10 marks)

Question 6

(a) **Figure 8** shows Wheatstone bridge application with tank level transmitter system.

- i. State type of level sensor A used in **Figure 8** (2 marks)
- ii. Calculate the variable resistor value R_3 when the bridge is at null condition. Given $R_1=1k\Omega$, R_2 is 500Ω and $R_4 = 200\Omega$ (3 marks)
- iii. A tank holds water with a depth of 7.0 ft. What is the pressure at the tank bottom in psi and Pa (4 marks)

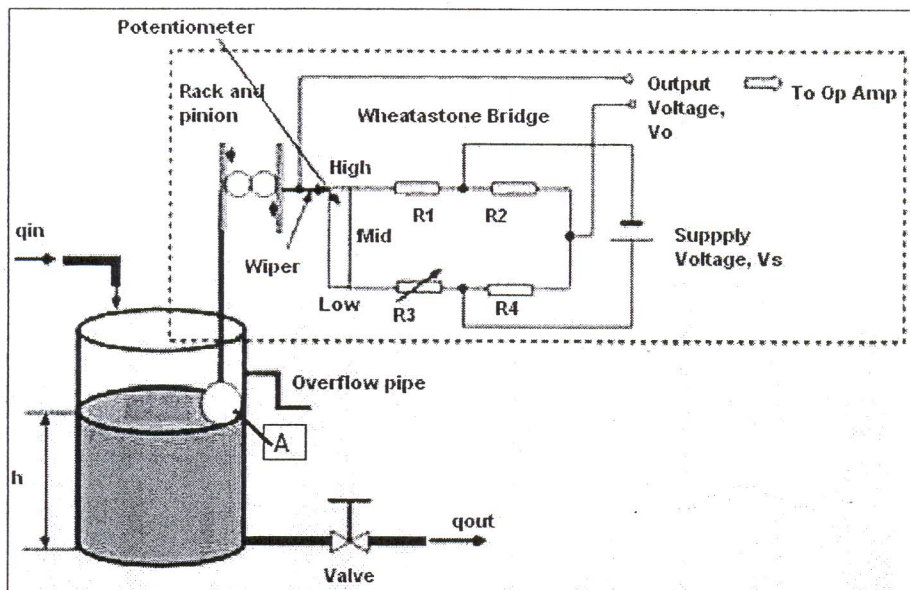


Figure 8: Tank Level System Control

- (b) State **two (2)** selection criteria to consider when choosing level sensor. (2 marks)
- (c) **Figure 9** below shows the diagram of a hardware configuration of NC machine
 - i. Name the components (A, B, C)
 - ii. Describe briefly the function of each component A, B and C
 - iii. Describe **three (3)** advantages of using Computer Numerical Control (CNC) in automation system

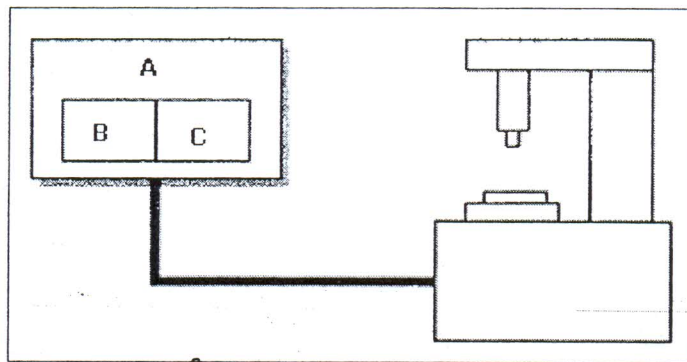


Figure 9: Diagram of NC machine

(9 marks)

END OF QUESTION