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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE	:	FAB 30203
SUBJECT TITLE	:	INDUSTRIAL NETWORKING
LEVEL	:	BACHELOR
TIME / DURATION	:	9.00am – 12.00pm (3 HOURS)
DATE	:	03 MAY 2010

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 three (3) question only.
6. Answer all questions in English.

THERE ARE 10 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

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

Question 1

(a) Identify the five components of a data communications system.

(5 marks)

(b) List the advantages of a multipoint connection over a point-to-point connection.

(2 marks)

(c) Draw a hybrid topology with a star backbone and 4 ring networks.

(3 marks)

(d) Refer to **Figure 1**, answer the following questions:

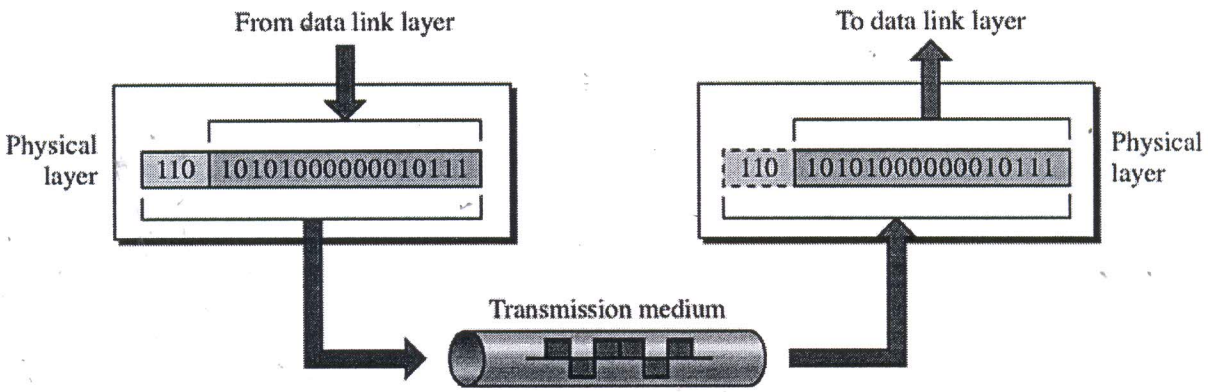

Figure 1: Physical layer

i. Define the purpose of physical layer.

(2 marks)

ii. Give three (3) different types of transmission mode.

(3 marks)

iii. Give two (2) types of transmission media.

(2 marks)

iv. Give one advantage and disadvantage of Shielded Twisted-Pair (STP) cable.

(3 marks)

Question 2

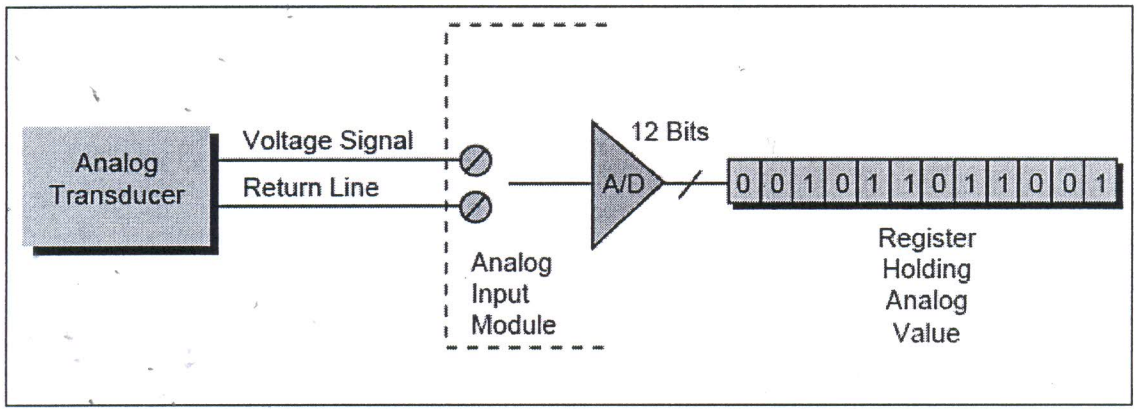

Figure 2 : Analog data input for digital transmission.

(a) Draw the graph based on **Figure 2**, data streams for the following line coding scheme:

i. NRZ-L

(2 marks)

ii. NRZ-I

(2 marks)

iii. Manchester code

(2 marks)

iv. Differential Manchester code.

(2 marks)

v. Multilevel scheme: 2B1Q scheme. Please use the following Table.

(2 marks)

Table 1 : Transmission table for 2B1Q scheme

Next bits	Next level: Previous level: positive	Next level: Previous level: negative
00	+1	-1
01	+3	-3
10	-1	+1
11	-3	+3

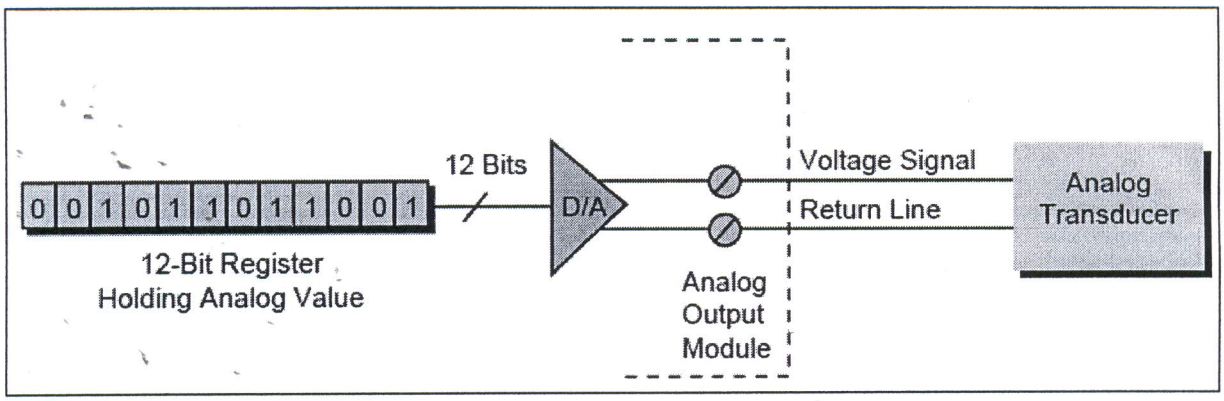

Figure 3 : Digital register to analog conversion

(b) Based on the **Figure 3**, draw the graph for the following digital to analog conversion :

i. Binary Amplitude Shit Keying (BASK).

(2 marks)

ii. Binary Frequency Shift Keying (BFSK).

(2 marks)

iii. Binary Phase Shift Keying (BPSK).

(2 marks)

(c) Describe the concept of a constellation diagram.

(4 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.
Please use the answer booklet provided.

Question 3

An Internet Service Provider (ISP) is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:

- The first group has 64 customers; each needs 256 addresses.
- The second group has 128 customers; each needs 128 addresses.
- The third group has 128 customers; each needs 64 addresses.

Design the sub-blocks and find out how many addresses is still available after these allocations. Your answer should be based on the following requirement:

i. State the address range for each group.

(6 marks)

ii. Calculate the total addresses allocation for each group

(6 marks)

iii. Calculate the total amount of available addresses

(4 marks)

iv. Draw the sub-blocks of the address allocation. State the address range found in (i) in your drawing.

(4 marks)

Question 4

a) Describe the procedure for CSMA/CD with relevant flow diagram.

(10 marks)

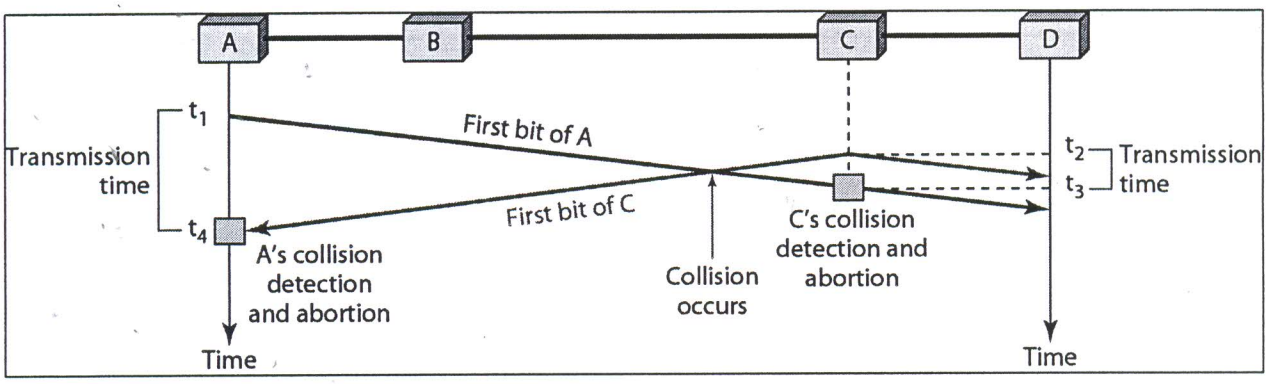

Figure 4 : Collision of the first bit in CSMA/CD

b) In **Figure 4**, the data rate is 10 Mbps, the distance between station between station A and C is 2000m, and the propagation speed is 2 X 10^8 m/s. Station A starts sending a long frame at time t_1 = 0; station C starts sending a long frame at time t_2 = 3 µs. The size of the frame is long enough to guarantee the detection of collision by both stations. Find:

i. The time when station C hears the collision (t_3).

(2 marks)

ii. The time when station A hears the collision (t_4).

(2 marks)

iii. The number of bits station A has sent before detecting the collision.

(2 marks)

iv. The number of bits station C has sent before detecting the collision.

(2 marks)

$$W_4 = \begin{bmatrix} +1 & +1 & +1 & +1 \\ +1 & -1 & +1 & -1 \\ +1 & +1 & -1 & -1 \\ +1 & -1 & -1 & +1 \end{bmatrix}$$

Figure 5: Generation of W_4

c) Calculate the Walsh table W_8 from W_4 in **Figure 5**.

(2 marks)

Question 5

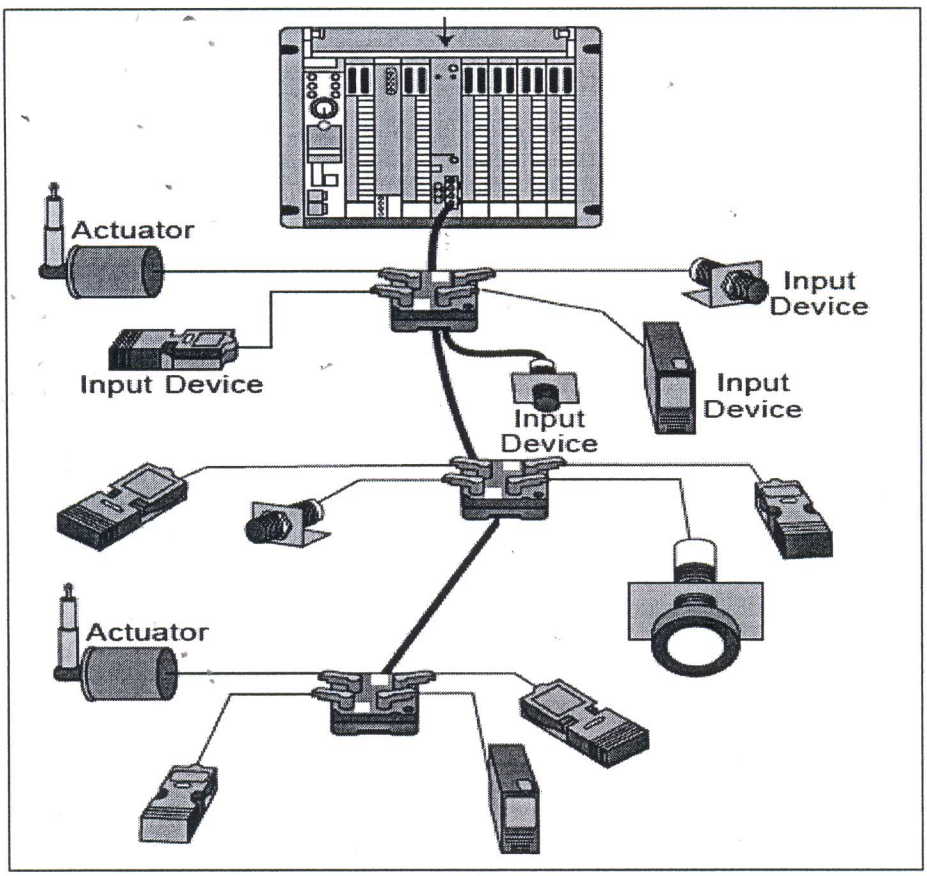

Figure 6: A system without proper industrial network protocol

a) Based on **Figure 6**, give suggestions to improve the industrial network system. Your answer should focus on the industrial network protocol and must support with the diagram

(8 marks)

b) If controller link is implemented to the system in **Figure 6**, draw a data link table with two PLC (Programmable Logic Controller). Use suitable address to show a different layer between internal bit and data word.

(6 marks)

c) Data link is the part of layer in OSI model; discuss the function of frame in the HDLC (High-level data link control).

(4 marks)

Question 6

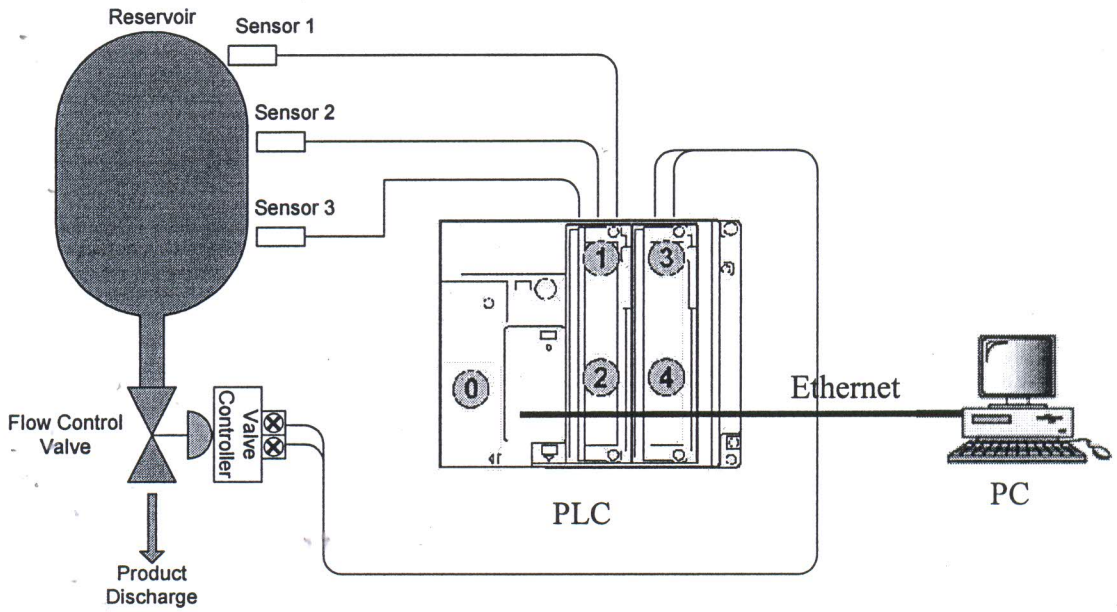

Figure 7: Flow Control System

The flow control system of a reservoir is shown in **Figure 7**. The system is now upgraded where HMI-Scada was introduced into the system. Based on **Figure 7** answer the following questions:

(a) Identify the input sensor(s) in the system.

(2 marks)

(b) Identify the actuator(s) used in this system.

(2 marks)

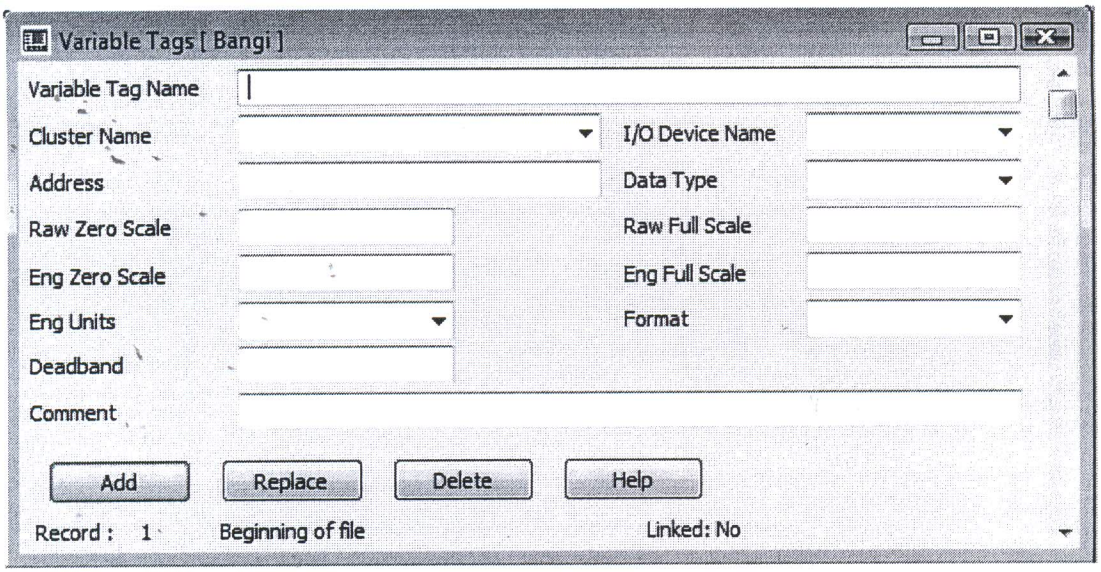

Figure 8: Variable tags for Scada

(c) Based on **Figure 8**, answer the following questions:

i. If the level sensor can measure 0 meter to 250 meters and can transmit 0V to 10V (PLC register: 0 to FFF Hex), what value should be set in **raw full scale** and **engineering full scale.**

(3 marks)

ii. State the data type of the variable tags.

(2 marks)

iii. If Device Net is implemented, state the suitable **Address** that can be used for this application.

(2 marks)

(d)

In order to establish a communication between the system and the control room, Ethernet communication has been installed. Now, with HMI-Scada, we can monitor the system in a distance. The PLC is configured with IP address of 192.168.197.15 while the PC in the control room is 192.168.197.103. Based on **Figure 9**, answer the following question:

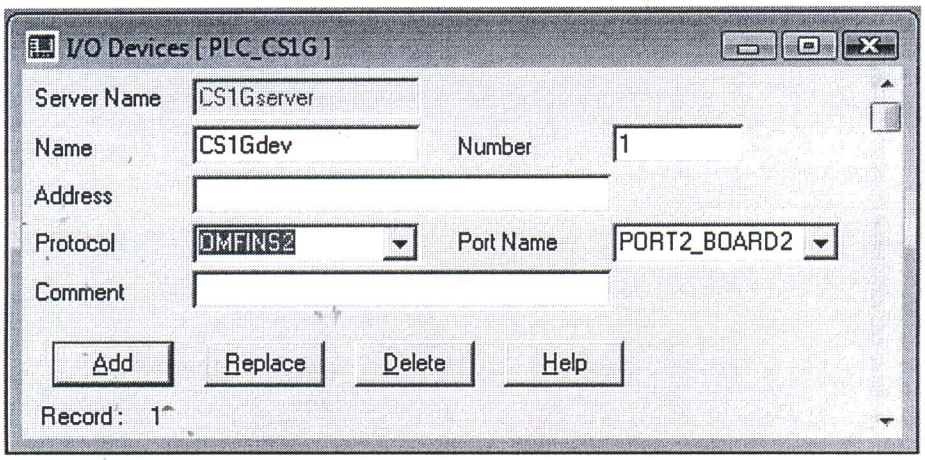

Figure 9: I/O device in Scada

i. State the **Address**.

(3 marks)

ii. Define the class, the IP version and the address space for both PLC and PC IP address.

(6 marks)

END OF QUESTION