(b) Write down the Functional Diagram instruction set of PLC for Data Transfer and Arithmetic and logical operation. (7)

6. (a) Define modelling and simulation of a plant. What are various steps to model a plant. Also Explain various steps to validate the model of a plant. (10)

(b) Why Hierarchical structure of DDC is needed? Explain hierarchical structure of DDC by describing functions performed by each level. (5)

7. (a) What is the structure of Industrial Automation of a plant? By considering example of Cement Plant, explain various steps for automation of an industrial plant. (10)

(b) Why Bus Arbitration technique is used for serial data communication. Explain Various schemes of Bus Arbitration and compare them. (5)

Roll No. ..... Total Pages : 4

009603

August/September 2022

B.Tech. (EIC) VI SEMESTER

Computer Based Instrumentation and Control

(EIEL-604)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) Differentiate between Dedicated, Distributed and central computer control plant automation. (1.5)

(b) Are Sync pulses used in TDM, if Yes Why? Justify your answer. (1.5)

(c) Define accuracy of Digital to analog converters. If the full-scale output is 15 V and accuracy is ±0.1 percent then what will be maximum error? (1.5)

(d) Differentiate between Nyquist rate and Nyquist interval? Give their significance. (1.5)

(e) Explain which type of controller mode builds up corrective action proportional to the length of time the disturbances persists. What are the two key characteristics of this control mode? (1.5)

(f) Why Dual computers are used in DDC? (1.5)

(g) By considering an example, differentiate between PLC and SCADA. (1.5)

(h) What is scan cycle and scan time? How are these related to each other? (1.5)

(i) What are advantages and sisadvantages of Simulation? How can we resolve the disadvantages of simulation? (1.5)

(j) What do you mean by Controller drift? Why it exists in a controller? (1.5)

PART-B

2. (a) What do you mean by Plant automation? What are different functions of computer in plant automation? (10)

(b) Explain Back up Concept of DDC. What is its significance? (5)

3. (a) Define and explain sampling theorem. What happen if the sampling frequency is

(i) $f_s > 2f_m$, (ii) $f_s < 2$ and (iii) $f_s = 2f_m$.

Where f_s is sampling frequency and f_m is maximum frequency present in the signal. What do you mean by aliasing. What are its effects and remedy? (8)

(b) With proper diagram, specify the sequence of action for Transfer of a data word from/by a processor to a serial input device using RS232. (7)

4. (a) Derive an expression for Velocity algorithm of DDC system. Why it is necessary to include integral term in velocity algorithm? What will happen if it not there? (8)

(b) Explain role of final control element in any control system. What are different ways to control the final control element of a plant? Compare them. (7)

5. (a) List the conditions for drawing the ladder logic? Draw and explain ladder diagram of PLC that will allow three switches in a room to control a single light source. Switching on any *three* switches turns the light ON, but all the three switches have to be off to turn OFF the light source. Also write down their corresponding Boolean Mnemonics. (8)