Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)
END SEMESTER EXAMINATIONS, APRIL - 2018

SUBJECT: INDUSTRIAL AUTOMATION [ICE 3201]

Duration: 3 Hour   Max. Marks:50

Instructions to Candidates:
❖ Answer **ALL** the questions.
❖ Missing data may be suitably assumed.

1A Using a neat schematic diagram, explain the working of a computer supervisory control system. 4

1B The plot of Figure Q.1B shows typical data taken or pressure variations in a reaction vessel. Determine the maximum time between samples for a computer control system to be used with this system. Discuss about the issues if the sampling time is less than the maximum determined time. 4

1C A computer must sequentially sample 100 process parameters. It requires 14 instructions at 5.3μs /instruction for the computer to address and process one line of data. The multiplexer switching time is 2.3μs, and the ADC conversion time is 34 μs. Find the maximum sampling rate for a line. 2

2A A digital controller is to be developed with the following specifications: KP = 50%/%, KI = 0.5 %/(%-min), KD = 0.08 %/(%/min), time between samples= 5s, input range 0 to 255, set point = 130. The output range is 0 to 255. Set up the control equations for PID control and draw the flow chart for implementation. 5

2B Draw a ladder logic program to implement a 4x1 Multiplexer using a PLC and discuss the operation. 3

2C Convert the ladder logic in Fig.Q-2.C to a Boolean equation. Then simplify it, and convert it back to simpler ladder logic. 2

3A With a neat timing diagram, explain positive edge triggered UP/DOWN counter. 4

3B In a safety critical process there are two inputs that must be turned ON within an interval of 15sec, for a machine to start. Write a ladder logic and structured text for the above requirement. 3

3C Describe non - retentive OFF delay timer. 3

4A Create a ladder logic program that will start when input A is turned on and calculate the series below. The value of n will start at 0 and with each scan of the ladder logic n will increase by 2 until n=20. While the sequence is being incremented, any change in A will be ignored. 4

$$X= 2*ASN(LN(n+20)/2)$$

4B Write a ladder logic to find the sum of Fibonacci numbers from 1 to 100 using for loop. 4

4C List any six instruction list commands used in programmable logic controllers. 2

5A Illustrate the hierarchy of a distributed computer control systems and list its advantages over centralized computer control systems.   5

5B Using a neat schematic discuss the structure and elements of a HART telegram.   3

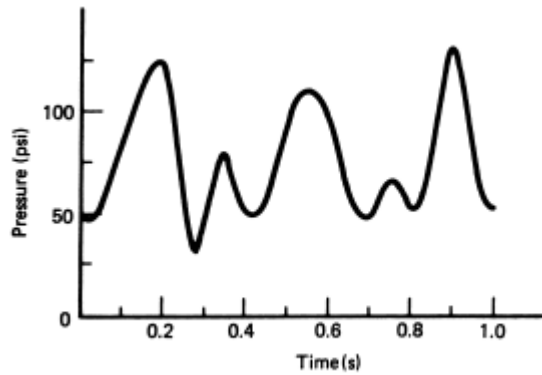**5C** Discuss how Cyclical Redundancy Check is carried out in MODBUS protocol.   2
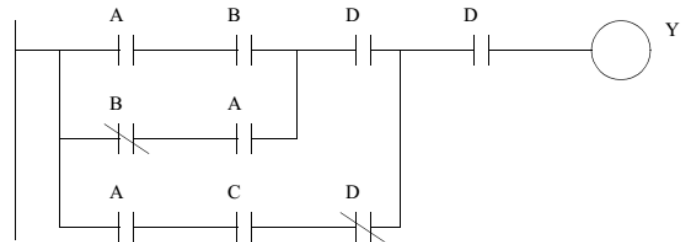

Fig.Q1.B

Fig.Q2.C

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