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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: INDUSTRIAL AUTOMATION & CONTROL [ELE 4015]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 28 November 2017** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Explain with the example why derivative control is not recommended for a flow control process? ***(02)***

1B. The transfer function of a first order plant is $G(S) = \frac{2}{1+2s}$. It is used in a unity feedback as shown in the figure 1B. Determine the proportional band and find the steady state error for a unit step input, and the time constant of the closed loop system, If Input to the controller is 60 kPa and this value corresponds to the set point, while the output of the controller is 80 kPa, After a load change, Determine the amount of 'Offset' that will result from the load change. ***(04)***

1C. Explain feed forward control with a block diagram, Design a feed forward control to control a gaseous flow inside a chemical tank reactor operating under controlled temperature ***(04)***

2A. With neat diagram explain three major elements of a PLC System and describe the most prominent advantages of the PLCs over hardwired Relay Contactor Logic ***(03)***

2B. Identify the inputs and outputs of the system shown in Figure 2B, design Process control system using PLCs and Program using Ladder logic to fill the two tanks with water by a pump. The pump is operating manually by a push-button "Start". When the first tank becomes full, the circuit should automatically start to fill the second tank by closing the first valve, and opening the second valve should start after 60 seconds, and when the second tank is full, the pump disconnects automatically and a "sign lamp" is turned on for 20 seconds to show that Second tank is full. ***(05)***

2C. With neat waveforms and Circuit, Explain the working of an OFF delay timer, Fixed width delay, Retentive and Non retentive Timer in process Application ***(02)***

3A. Write the advantage and disadvantage in Incremental coordinate system compared to the absolute one in CNC Machine. ***(03)***

3B. Sketch the construction of a Pneumatically actuated Diaphragm type single-seated control valve. ***(04)***

3C. Explain why gear pumps usually operate at comparatively low pressure medium in the Hydraulic system. ***(03)***

4A. Explain the Architecture of SCADA system considering a typical example of Chemical Industry. ***(05)***

4B. Describe the types of Distributed Control system employed in Industrial Automation system ***(05)***

5A. Describe the various different connection employed in Profibus –DP as field bus to connect distant actuators and sensors with neat diagram ***(03)***

5B. With neat diagram Describe various states of the task undertaken by RTOS ***(03)***

5C. List advantage and disadvantage of Flexible Manufacturing system ***(04)***

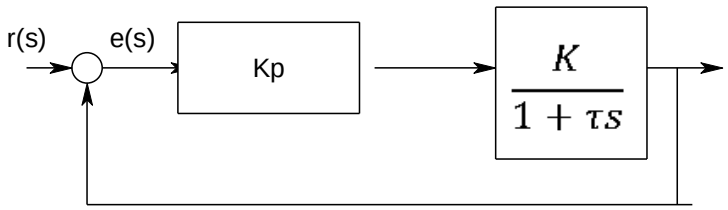

Figure 1B

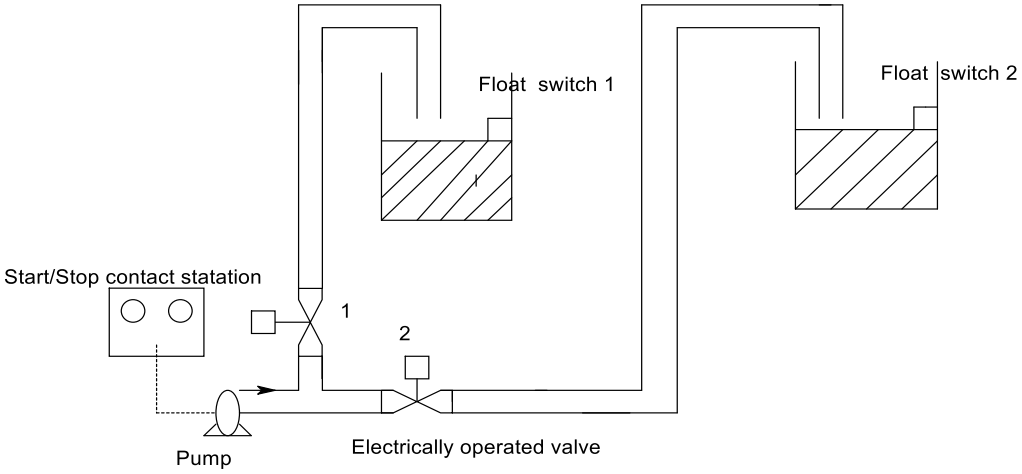

Figure 2B