

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2022

M. Tech. in Automation and Robotics, Semester II, 2021-22

ME1207: MECHATRONICS

Roll No.....

Time: 2 hours

Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

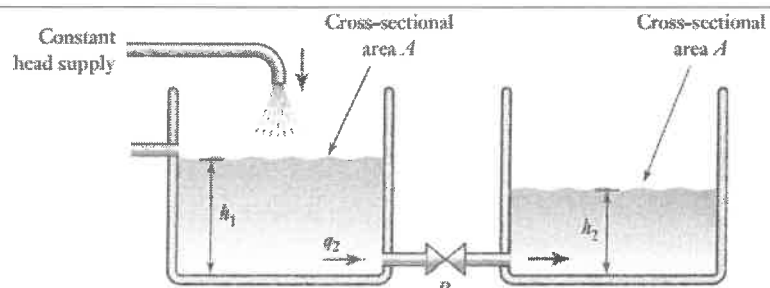
Q.1. Identify the various elements that might be present in a control system involving a thermostatically controlled electric heater. 3
(LO1)

Q.2. A copper-constantan thermocouple is to be used to measure temperatures between 0 and 200°C. The e.m.f. at 0°C is 0 mV, at 100°C it is 4.277 mV and at 200°C it is 9.286 mV. What will be the non-linearity error at 100°C as a percentage of the full range output if a linear relationship is assumed between e.m.f. and temperature over the full range? 4
(LO1)

Q.3. An inverting amplifier has an input resistance of 2 kΩ. Determine the feedback resistance needed to give a voltage gain of 100. 3
(LO2)

Q.4. In monitoring the inputs from a number of thermocouples the following sequence of modules is used for each thermocouple in its interface with a microprocessor
Protection, cold junction compensation, amplification, linearisation, sample and hold, analogue-to-digital converter, buffer, multiplexer.
Explain the function of each of the modules. 4
(LO2)

Q.5. Derive the relationship between the height h_2 and time for the hydraulic system shown in Fig. 1. Neglect inertance. 4
(LO2)



Q.6. A mercury-in-glass thermometer has a time constant of 10 s. If it is suddenly taken from being at 20°C and plunged into hot water at 80°C, what will be the temperature indicated by the thermometer after (a) 10 s, (b) 20 s? 4
(LO1,2)

Q.7. Design a system involving a PLC for the placing on a conveyor belt of boxes in batches of four. 8
(LO3)