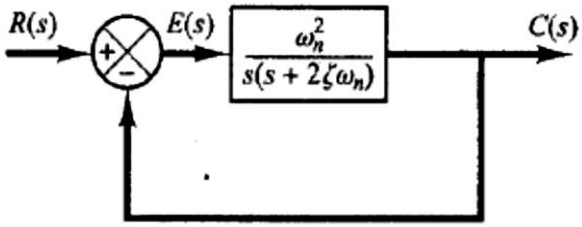
Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Course: Process Instrumentation and Control **Semester: VI**
Program: B. Tech FSE engineering **Time 03 hrs**
Course Code: ECEG 3009 **Max. Marks: 100**
Instructions:

1. **Attempt all questions serially as per question paper.**
2. **Answer should be neat and clean. Draw a free hand sketch for circuits/tables/schematics wherever required.**

SECTION A - 30 Marks

S. No.	Attempt all questions.	Marks	CO
Q 1	What are the basic component of a closed loop control system.	**5**	**CO1**
Q2	The characteristics equation of a system in differential form is $$\ddot{x} - (K+2)\dot{x} + (2K+10)x = 0$$ Find the values of K for which the system is (i) stable (ii) limited stable and (iii) unstable.	**5**	**CO1**
Q 3	Compare and contrast a thermocouple with a thermistor as a temperature transducer.	**5**	**CO3**
Q 4	What do you understand by orifice meter? Explain the working of orifice meter with suitable diagram?	**5**	**CO3**
Q 5	For the block diagram shown in fig. 1. Find the value of transfer function Classify the system output behavior based on the value of damping ratio.  Figure 1	**5**	**CO1**
Q 6	What do you understand by venture meter. Explain the working of venturi meter with suitable diagram?	**5**	**CO3**

Section B – 50 Marks			
Q 7	From the root locus plot find the range of value of K for which the system will have damped oscillatory response. Find the break-away points of the root locus defined for G(s)H(s)= K/s(s+4)(s+5)?	**10**	**CO 2**
Q 8	Elucidate the mathematical equation of PID controller. What is the advantage of PI controller over PD controller?	**10**	**CO2**
Q 9	A unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$. Determine the gain K so that the system will have a damping ratio of 0.5. For this value of K determine the settling time. peak overshoot and time to peak overshoot for a unit step input.	**10**	**CO1**
Q 10	What are sensor available for pressure measurement? Explain the working of bellows.	**10**	**CO3**
Q11	Obtain the transfer functions for the following systems with state-space models Available as given below also comment on controllability and observability. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u\,; \quad y = [1 \quad 0]\begin{bmatrix}x_1\\ x_2\end{bmatrix} + [0]u$	**10**	**CO2**
SECTION C, 20 Marks			
Q12 (i)	What do you understand by automation? Differentiate between different types of automation. Draw automation pyramid in with all the stages.	**10**	**CO4**
(ii)	Explain the role of communication in SCADA. Enumerate various available communication modes for communicating RTU & MTU.Describe the features and economic benefits of SCADA system.	**10**	**CO4**