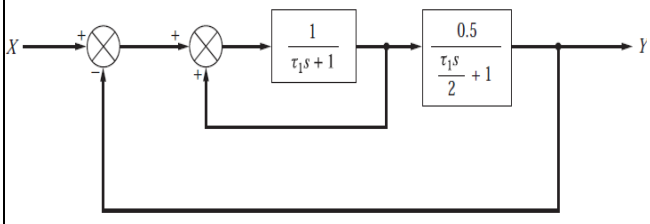
Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2018

Course: M. Tech RE **Semester:** II
Subject: Instrumentation and Control of Rotating Equipment
Time: 03 hrs. **Max. Marks:** 100
Instructions: Assume the appropriate value of missing data if any.

SECTION A (4×5=20 M)
All the questions are compulsory

S. No.		Marks	CO
Q 1	What are the different elements of a measuring instrument? Explain using an example. (2 + 2)	4	CO1
Q 2	What is the desired order of any measuring device? What is the desired relationship between the measuring instrument lag and the process lag?	4	CO2
Q 3	What is the working principle of flow measuring devices venturimeter, orifice meter rotameter? What is the order of these devices?	4	CO2
Q 4	Write the difference between close loop and open loop system in one line. Draw a block-diagram of feed-back (Closed) control loop system by mentioning different parts of it.	4	CO3
Q 5	What is transfer function? (two line answer) What is the standard form of transfer function of first order system?(one line answer) (2+2)	4	CO3
	SECTION B (10×4= 40 M) **Answer all the questions. Q 8 has an internal choice**		
Q 6	Point out the working principles of different pressure and vibration measuring devices? (5+5)	10	CO2
Q 8	A step change of magnitude 4 is introduced into a system having the transfer function $\frac{Y(s)}{X(s)} = \frac{10}{s^2 + 1.6s + 4}$ Determine (a) Percent overshoot (b) Maximum value of Y(t) (c) Ultimate value of Y(t)	10	CO3
Q 7	 Find the transfer function $Y(s)/X(s)$ of the system shown in the figure OR Prove that the two first order processes (non - interacting) in series is equivalent to a second order process which is always over- damped in nature.	10	CO3

Q 9	What is bode diagram? What is corner frequency? Plot the bode diagram for a first order system.	**10**	**CO5**
	SECTION-C (20×2= 40 M) **Answer any two questions**		
Q 10	Explain all the static characteristics (i) Accuracy (ii) Reproducibility (iii) Sensitivity of a typical measuring element. (4+4+4) Explain the dynamic characteristics (i) Speed of response (ii) Fidelity of a typical measuring Instrument. (4+4)	**20**	**CO1**
Q 11	Design a PID controller for the following process using Ziegler-Nichols tuning $$G_p(s) = \frac{4e^{-s}}{(5s+1)}; \quad G_m = \frac{1}{4}; \quad G_v = 2$$ OR If you are a design engineer and you want to propose a PI controller over P controller already existing in the plant then how will you justify your suggestion? If the plant operator asks you why not use a PID controller, but you find out that it cannot be used. What can be the reason of refusing the PID controller other than it is complex system? If the operator asks you to tune the parameter K_C and τ_I and inform you that the plant cannot handle the error to be persistent for a very long time.	**20**	**CO5**