Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

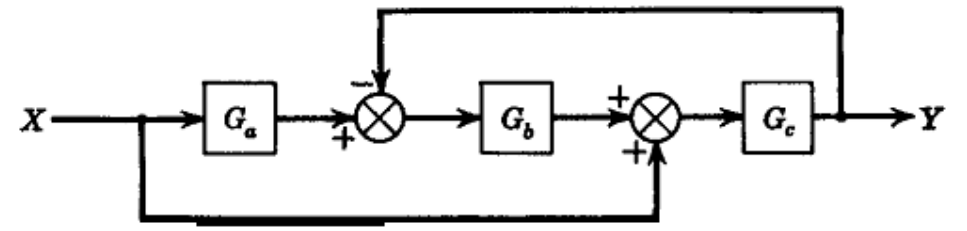
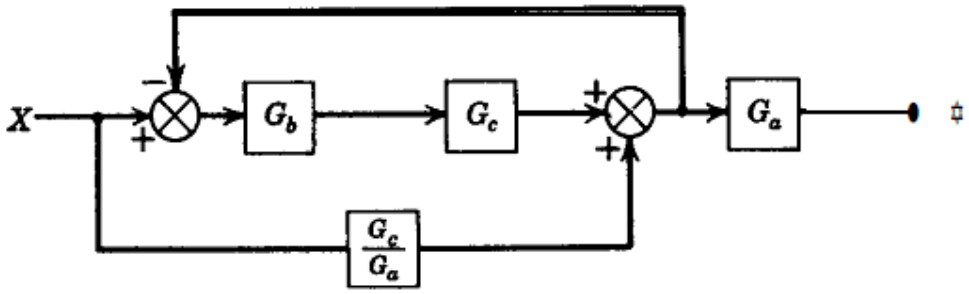
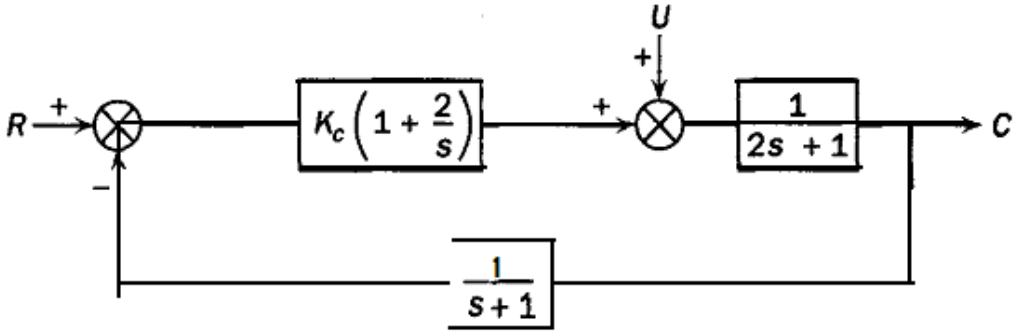
Programme Name: M. Tech. RE **Semester** : II
Course Name : Instrumentation and process control of rotating equipment **Time** : 3 hrs
Course Code : CHPD7019 **Max. Marks** : 100
Nos. of page(s) : 03
Instructions : Assume any missing data. Draw the diagrams wherever necessary.

SECTION A
(20 marks)

S. No.		Marks	CO
Q 1	**Outline** the static characteristics of the instruments.	5	CO1
Q 2	**List** the main components of a control system in a closed loop by diagram	5	CO1
Q 3	**Describe** the various instruments used to measure temperature.	5	CO2
Q 4	With a neat diagram **explain** the working and principle of total radiation pyrometer	5	CO2

SECTION B
(40 marks)

Q 7	With a neat diagram **recall** the working of elastic diaphragm transducers.	10	CO1
Q 8	A pneumatic proportional controller is used to control the temperature within the range 60 to 100^{O}F. The controller is adjusted so that the output pressure goes from 3 to 15 psi (fully open to fully close) as the measured temperature goes for 71 to 75^{O}F. **Interpret** the gain and proportional band.	10	CO2
Q9	**Demonstrate** different types of controller used industrially, with their mode of action. OR **Predict** the offset of a proportional and proportional derivative controller by taking one example	10	CO3

Q 10	 (a)  (b) **Determine** the transfer function Y(s)/X(s) for the block diagrams shown above	**10**	**CO3**
	SECTION-C **(40 marks)**		
Q 10	**Illustrate** the theorems of the Routh test. With the use of Routh stability criterion, **devise** the ultimate value of Kc for which the above which the given system is unstable. 	**20**	**CO4**
Q12	**Illustrate** the root locus for the open loop transfer function $G=\frac{K}{(s+1)(s+2)(s+3)}$ OR **Illustrate** the Bode diagram for the open loop transfer function $\frac{100}{(10s+1)(s+1)}$	**20**	**CO4**

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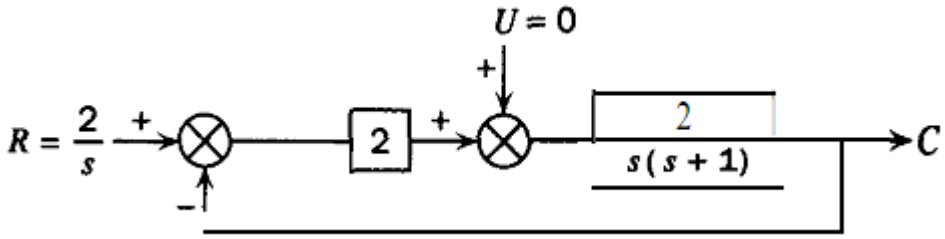
SECTION A
(20 marks)

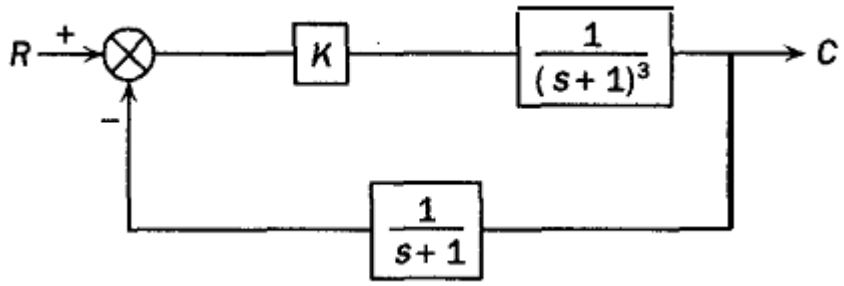
S. No.		Marks	CO
Q 1	**Define** the dynamic characteristics of control system.	5	CO1
Q 2	With a neat diagram **outline** the working and principle involved in LVDT for the measurement of distance.	5	CO1
Q 3	With a neat sketch **explain** the working of platinum resistance thermometer	5	CO2
Q 4	**Describe** a control valve with a diagram.	5	CO2

SECTION B
40 marks

Q 7	**Identify** the ideal transfer function of the control valve.	10	CO1
Q 8	**Explain** the dynamic characteristics of viscous damper	10	CO2
Q9	A pneumatic PI controller has an output pressure of 10 psi when the set point and pen point are together. The set point and pen point are suddenly displaced by 0.5 inch (a step change is introduced in the error), and the following data is obtained. **Calculate** actual gain and integral time.	10	CO3
Q10	 For the control system shown above, **perform** (i) C(s)/R(s) (ii) C(α) (iii) Off set OR **Present** servo and regulatory problem with the appropriate examples.	10	CO3

Time (sec)	-0	+0	20	60	90
Pressure (psig)	10	8	7	5	3.5

SECTION-C
(40 marks)

Q 11	 Using Routh test, **analyze** the value of K above which the system becomes unstable. If the system is on the verge of unstable condition, **simplify** the roots which make the system unstable.	**20**	**CO4**
Q12	**Illustrate** the root locus diagram for the open loop transfer function $G=\frac{K}{(s+1)(2s+1)}$ OR **Illustrate** t the Bode diagram for the system whose transfer function is $\frac{1}{(s+1)(s+5)}$	**20**	**CO4**