Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

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

Course: Control system engineering **Semester: VIII**
Program: B.tech ASE/AVE **Time 03 hrs.**
Course Code: ECEG 4007 **Max. Marks: 100**

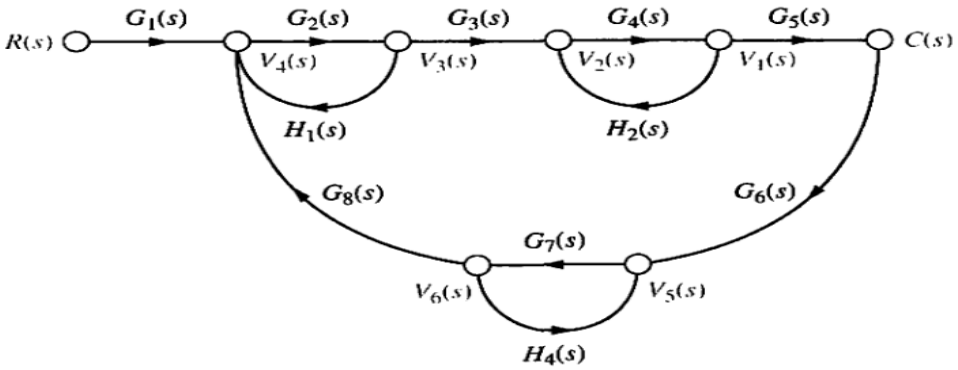
SECTION A

1. **Each Question will carry 5 Marks**
2. **Instruction: Complete the statement / Select the correct answer(s)**

S. No.	**Question**	**CO**
Q 1	What will be the nature of time response if the roots of the characteristic equation are located on the s-plane imaginary axis? a) Oscillations b) Damped oscillations c) No oscillations d) Under damped oscillations	**CO2**
Q2	_____ controller is handy to deal with steady state error.	**CO3**
Q3	Consider a system with transfer function G(s) = s+6/Ks^2+s+6. Its damping ratio will be 0.5 when the values of k is: a) 2/6 b) 3 c) 1/6 d) 6	**CO2**
Q4	The output in response to a unit step input for a particular continuous control system is c(t)= 1-e^{-t}. What is the delay time Td? a) 0.36 b) 0.18 c) 0.693 d) 0.289	**CO2**
Q5	For the system 2/s+1, the approximate time taken for a step response to reach 98% of its final value is: a) 1s b) 2s c) 4s d) 8s	**CO1**
Q6	_____ are two practical examples of open loop and closed loop system respectively.	**CO1**

SECTION B

1. **Each question will carry 10 marks**
2. **Instruction: Write short / brief notes**

Q 7	Dynamic behavior of control systems can be adequately judged and compared under application of standard test signals. Describe various standard test signals commonly used in control system design. Give time domain, s-domain, and graphical representation of the signals.	**CO1**
Q 8	Derive the transfer function C(s)/R(s) for the given SFG using mason's gain formula 	**CO3**
Q 9	Derive the transfer function representation from the generalized state space model.	**CO4**
Q 10	The maximum overshoot and settling time for a control system whose overall transfer function is standard second order system are 10% and 4 second respectively. The input being a unit step function. Determine the value of ζ and ω_n in order to satisfy these requirements.	**CO2**
Q 11	Determine the value of K for the following equation such that the roots lie towards the left of line s = -1 in s-plane using Routh-hurwitz criterion. $$s^3 + 3s^2 + 3s + K$$	**CO1**
Section C 1. **Each Question carries 20 Marks.** 2. **Instruction: Write long answer.**		
Q12	Sketch the root locus plot for the system when open loop transfer function is given by $G(s)H(s) = \frac{K}{s(s+4)(s^2+4s+13)}$; Also determine (i) The value of K such that system become marginally stable. (ii) Frequency value for sustain oscillation. OR A system is represented by the equations given below $$\begin{bmatrix} \dot{x_1} \\ \dot{x_2} \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u; x(0) = [1\ 1]^T$$ Determine the state transition matrix ϕ(t).	**CO4**