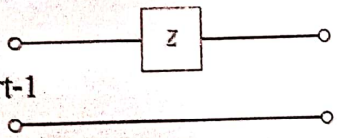
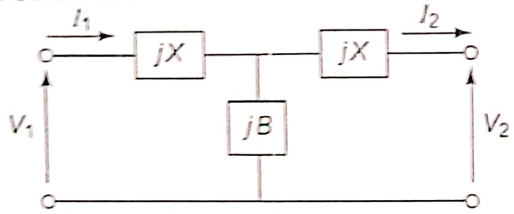
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
UNA (HP)
An Institute of National Importance under MoE
Saloh, Una (HP) – 177 209
Website: www.iiitu.ac.in

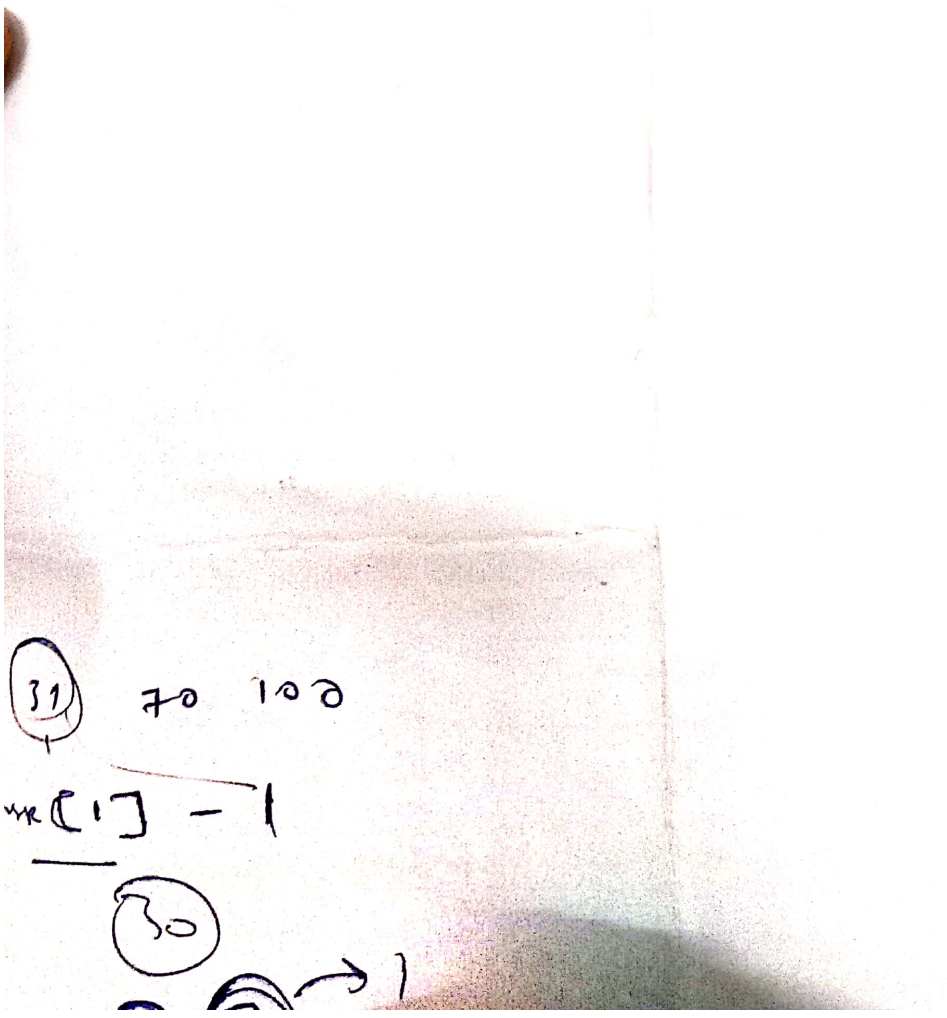
School of Electronics
CURRICULUM: HITUGECE22
Cycle Test - I
February 20, 2023

Degree	B. Tech.	**Branch**	ECE
Semester	IV		
Subject Code & Name	ECC401: Microwave Engineering		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

Sl. No.	Question	Marks
1.a	Starting from the Maxwell equations, deduce all the transverse field components in terms of longitudinal components for a wave propagating in +z direction.	1
1.b	What is wave impedance? Differentiate the wave impedance for TEM, TE, and TM modes of propagation.	2
1.c	Terrestrial telecommunications systems commonly aggregate large numbers of individual communications links into a single high-bandwidth link. This is often implemented as a radio link between dish-type antennas having gain of about 27 dBi mounted on very tall towers and operating at frequencies around 6 GHz. Assuming the minimum acceptable receive power is −120 dBm (−120dB relative to 1 mW; i.e., 10^{-15} W) and the required range is 30 km, what is the minimum acceptable transmit power?	2
2.a	Why TEM wave propagation is not possible in rectangular wave guide?	1
2.b	Find the equivalent voltages and currents for a TE10 mode in a rectangular waveguide and also calculate the relevant characteristic impedance.	2
2.c	An infinite sheet of surface current can be considered as a source for plane waves. If an electric surface current density $Js = J_0 \hat{x}$ exists on the $z = 0$ plane in free space, find the resulting fields by assuming plane waves on either side of the current sheet and enforcing boundary conditions.	2
3.a	Find the reflection coefficient at port-1 of the following network shown in Fig. 1  Fig. 1	1
3.b	What are the properties of scattering matrix? Explain them with suitable expressions.	2

3.c	A two-port network is known to have the following scattering matrix: $[S] = \begin{bmatrix} 0.15\angle 0^0 & 0.85\angle -45^0 \\ 0.85\angle 45^0 & 0.2\angle 0^0 \end{bmatrix}$ Determine if the network is reciprocal and lossless. If port 2 is terminated with a short circuit, what is the reflection coefficient seen at port 1?	2
4.a	If a lossless two-port network is reciprocal, show that $\|S21\|^2 = 1 - \|S11\|^2$.	1
4.b	In a lossless transmission line, a symmetric T-junction is formed as shown in Fig. 2. Find the resultant ABCD matrix.  Fig. 2	2
4.c	Evaluate the transverse component H_x in terms of longitudinal components when the wave is travelling in $+y$ direction.	2

**** GOOD LUCK ****



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AY 2022-23

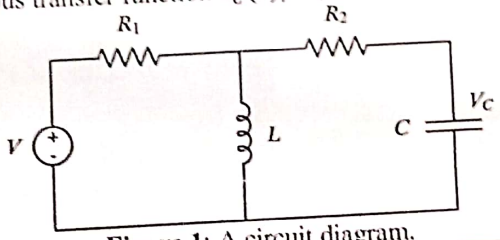
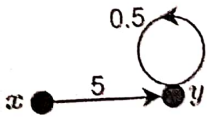
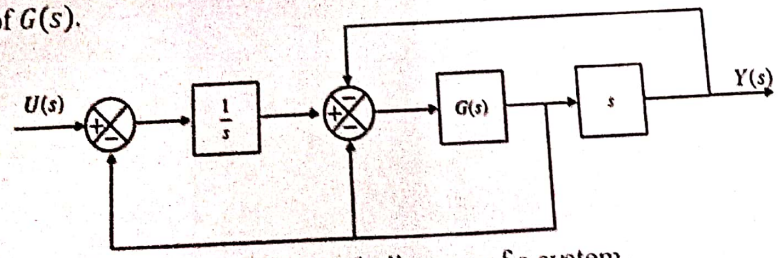
School of Electronics

CURRICULUM: IIITUGECE22

Cycle Test – I

20, Feb.'23

Degree	B. Tech.	Branch	ECE
Semester	IV		
Subject Code & Name	ECC402 (Control Systems)		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

S. No.	Question	Marks
1.a	Why is it required to obtain an analytical model of a system/plant? What are the advantages provided by the transfer function approach in the analytical modelling of the systems?	1
1.b	Determine the *F-V* analogous transfer function $V_c(s)/V(s)$ of the circuit shown in Figure 1.  **Figure 1**: A circuit diagram.	2
1.c	The human eye has a biological control system that varies the pupil diameter to maintain constant light intensity to the retina. As the light intensity increases, the optical nerve sends a signal to the brain, which commands internal eye muscles to decrease the pupil's eye diameter. When the light intensity decreases, the pupil diameter increases. Draw a functional block diagram of the light-pupil system indicating the input, output, and intermediate signals; the sensor; the controller; and the actuator.	2
2.a	The SFG of a system having the relation $y = Tx$ is shown in Figure 2. Determine the value of T.  **Figure 2**: Signal flow graph of a system.	
2.b	The block diagram of a system is shown in the Figure 3. If the desired transfer function of the system is: $$\frac{Y(s)}{U(s)} = \frac{s}{s^2+s+2}$$ Find the value of $G(s)$.  **Figure 3**: Block diagram of a system.	
2.c	Find the transfer function $Y(s)/U(s)$ of the system shown in Figure 4 using block diagram reductio	

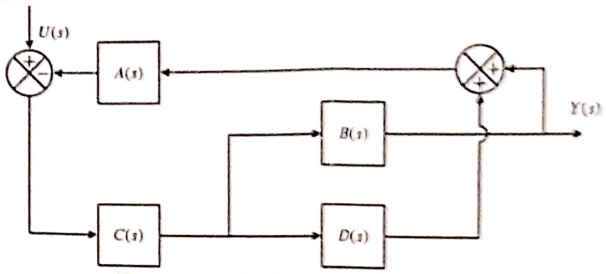


Figure 4: Block diagram of a system.

3.a	What is the difference between the natural frequency and the damped frequency of oscillation?	1
3.b	Find the transfer function $Y(s)/R(s)$ for the system represented by the block diagram shown in Figure 5.	2

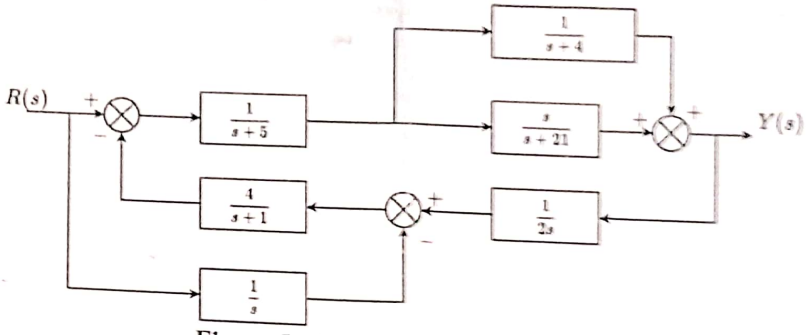


Figure 5: Block diagram of a system

3.c	For the transfer functions given below, determine the value of damping ratio and the type of response expected. $G_1(s) = \frac{12}{s^2+8s+12}$ $G_2(s) = \frac{16}{s^2+8s+16}$ $G_3(s) = \frac{20}{s^2+8s+20}$ $G_4(s) = \frac{24}{s^2+8s+24}$	2
4.a	Why is it necessary to analyse the time response of the control system with certain standard test signals? Justify with the help of an example.	1
4.b	Determine the time response of the RC circuit, shown in Figure 6, when it is subjected to the following input signals: i. Unit step signal ii. Ramp signal	2

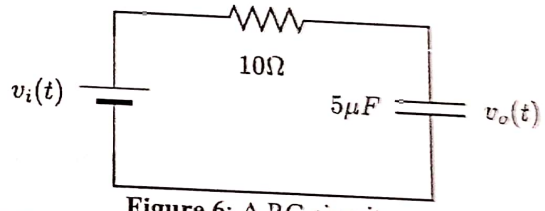


Figure 6: A RC circuit.

4.c	The pole-zero plot of a system is shown in Figure 7. Determine the transfer function of the system.	2

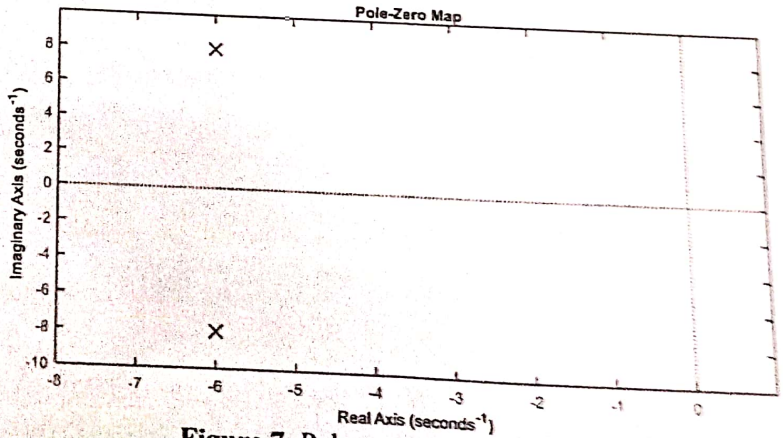


Figure 7: Pole zero plot of a system.

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AY 2022-23
School of Electronics
CURRICULUM: HITUECE22
Cycle Test – I
21, February'23

Degree	B. Tech.	Branch	ECE
Semester	IV		
Subject Code & Name	ECC403: Microprocessors and Microcontrollers		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

Sl. No.	Question	Marks
1.a	Draw the format of 8086 flag register.	(1)
1.b	Discuss the externally or peripherally initiated operations of 8086 microprocessor.	(2)
1.c	Explain the need of stack by using the diagram with proper addresses.	(2)
2.a	Discuss the use of Bus high enable signal with its memory diagram.	(1)
2.b	Discuss the interrupt table of 8086. Show the calculation of addresses for INT-8 Interrupt.	(2)
2.c	What is CALL operation? How does it differ from JUMP operation? Justify the answer with proper example.	(2)
3.a	What is the similarity and difference between the subtract and compare instructions.	(1)
3.b	Write an ALP to convert the temperature in Fahrenheit into Celsius.	(2)
3.c	Write an assembly language program to compute the following: $[CX] \leftarrow 5 \times [AL] - 6 \times [BH] + \frac{[BH]}{8}$ without using DIV instruction.	(2)
4.a	Write a program to add a data byte located at offset 0500H in 2000H segment to another data byte available at 0600H in the same segment and store the result at 0700H in the same segment.	(1)
4.b	With suitable example explain the difference between the following instructions: (i) DAA (ii) AAA (iii) AAD (iv) AAM	(2)
4.c	Draw the diagram for the interfacing of 8KB of EPROM and 8KB of RAM to 8086 microprocessor.	(2)

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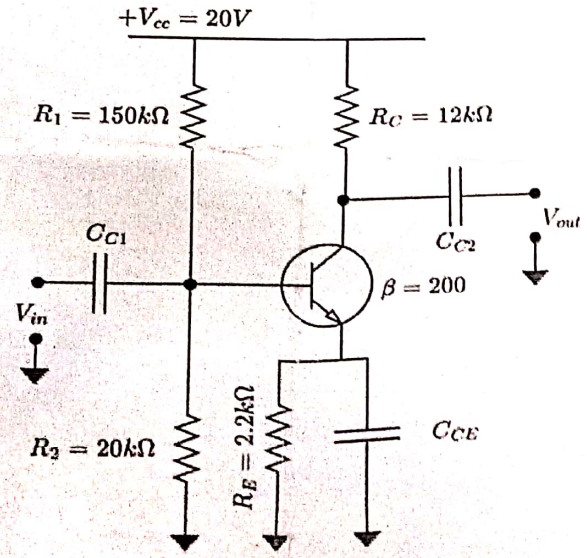
AY 2022-23
School of Electronics
CURRICULUM: IIITUGECE22
Cycle Test – I
21, Feb.'23
Time: 02:00-03:00PM

Degree	B. Tech.	Branch	ECE
Semester	IV		
Subject Code & Name	ECC404: Linear Integrated Circuits		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

Sl. No.	Question	Marks
1.a	Explain the importance of gain bandwidth product and compare with FET.	(1)
1.b	Derive expression for voltage gain, input and output resistance for common gate amplifier.	(2)
1.c	In a transistor amplifier, when the signal changes by 0.02V, the base current changes by 10 μA and collector current by 1mA. If collector load R_C = 5 kΩ and R_L= 10 kΩ, find: (i) current gain (ii) input impedance (iii) A.C. load (iv) voltage gain.	(2)
2.a	Explain the need of Darlington pair circuit. Justify it.	(1)
2.b	Discuss the low frequency response of BJT amplifier and the effect of coupling and bypass capacitors.	(2)
2.c	For the amplifier circuit shown in Figure 1, find the voltage gain of the amplifier with (i) CE connected in the circuit (ii) CE removed from the circuit.  Figure 1	(2)

	If the differential voltage gain and the common mode voltage gain of a differential Amplifier are 48dB and 2dB, then determine the Common Mode Rejection Ratio.	(1)
b	Obtain the voltage gain, input resistance and output resistance for differential Op-Amp.	(2)
	In the circuit shown in Figure 2, the Op-Amps used are ideal. Calculate the output V_0 for Op-Amps.	(2)

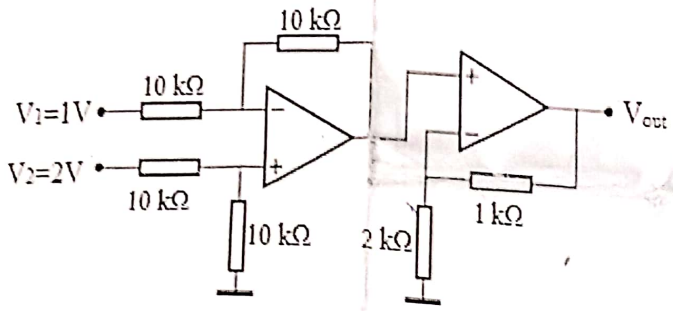


Figure 2

	Draw block diagram of Op-Amp and describe the function of each block.	(1)
	If $V_1 = 10 \cos 2t$ mV and $V_2 = 0.5t$ mV, find V_0 in the Op-Amp circuit in Figure 3. Assume that the voltage across the capacitor is initially zero.	(2)

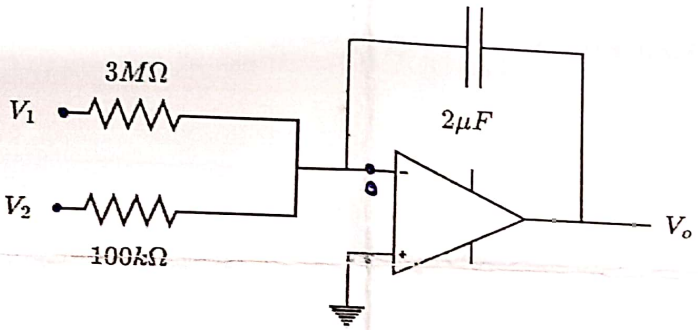


Figure 3

	dual op-amp instrumentation amplifier is shown in Figure 4. Obtain the expression or the output voltage of the amplifier.	(2)

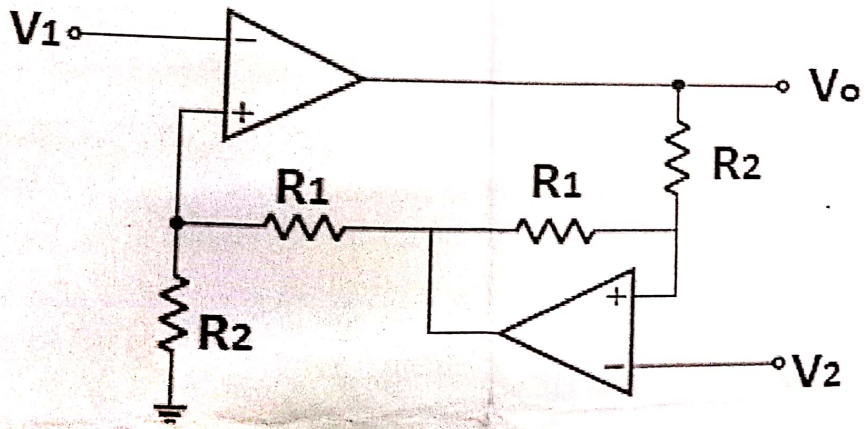


Figure 4

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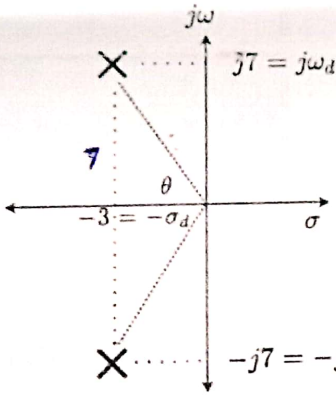
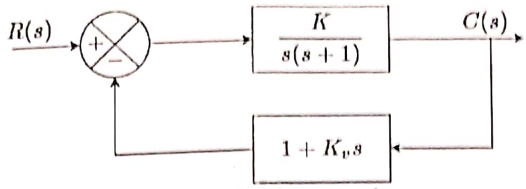
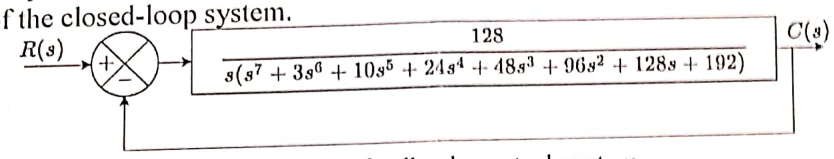
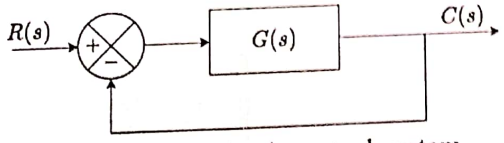
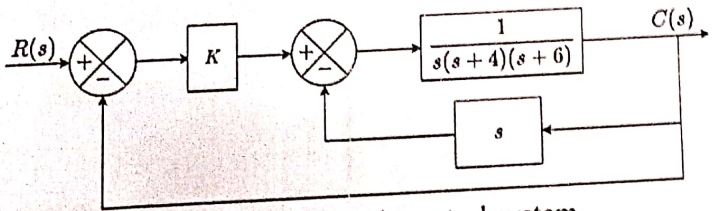
AY 2021-22
School of Electronics
CURRICULUM: IIITUGECE19
Cycle Test – II
11, Apr.'22

Degree	B. Tech.	Branch	ECE
Semester	VI		
Subject Code & Name	ECC402 / Control Systems		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

Sl. No.	Question	Marks
1.a	Why is it necessary to analyse the time response of the closed loop systems?	1
1.b	Given the pole-zero plot shown in Figure 1, find the damping ratio ζ; natural frequency ω_n; peak time T_p; overshoot percentage %OS, and settling time T_s.  Figure 1: Pole-zero map of a system	2
1.c	A closed-loop system is represented by $\frac{d^2c}{dt^2} + 4.8\frac{dc}{dt} = 144e$ where $e = r - 0.5c$ is the actual signal. Find the value of the damping ratio, damped and underdamped frequency of the oscillations.	2
2.a	If a pole is moved with a constant imaginary part, what will the responses have in common?	1
2.b	The response of a 2nd order control system has an overshoot of 30% for a unit step input and the overshoot takes place at 0.05 sec. after the application of the input. Find the transfer function of the system.	2

2.c	Determine the values of K and velocity feedback constant K_V, so that the maximum overshoot in the unit step response is of 0.2 and peak time is 1 sec. With the obtained values of K and K_V determine the values of rise time and settling time.  Figure 2: A feedback control system	2
3.a	Why are marginally stable systems considered unstable under the BIBO definition of stability?	1
3.b	What is meant by stability of a system? How the roots of the characteristic equation impact the overall stability of the system? Justify with the help of an example.	2
3.c	Find the number of poles in the left half-plane, the right half-plane, and on the $j\omega$-axis for the system of Figure 3. Draw conclusions about the stability of the closed-loop system.  Figure 3: A feedback control system	2
4.a	Does the presence of an entire row of zeros always mean that the system has $j\omega$ poles?	1
4.b	In the system shown in Figure 4, let $G(s)$ be $$G(s) = \frac{K(s+1)}{s(s-2)(s+3)}$$ Find the range of gain, K, for the system of Figure that will cause the system to be stable, unstable, and marginally stable. Assume K > 0.  Figure :4 A feedback control system	2
4.c	For the system shown in Figure 5, find the value of gain, K, that will make the system oscillate.  Figure 5: A feedback control system	2

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