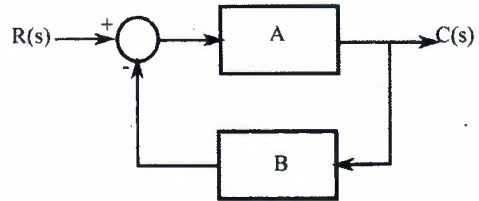


8. _____ is unit ramp function.
 Derivative of unit impulse. Integration of unit impulse.
 Derivative of unit step. Integration of unit step.

9. The overall gain of the following closed loop system is _____.



- $\frac{A}{1+AB}$ $\frac{A}{1-AB}$
 $\frac{1+AB}{A}$ $\frac{1-AB}{A}$

10. A closed loop system is marginally stable if all the poles of the system lies at
 Left side of imaginary axis. Right side of the imaginary axis.
 Imaginary axis. One on left and one on right of imaginary axis.

11. Due to the negative feedback in control system, the _____.
 system becomes unstable transient response decays quickly.
 transient response decays slowly no change

12. The bias adjustment in signal conditioning is also called _____.
 amplification zero shift linearization attenuation

13. High-pass, low-pass and notch filters are used to _____.
 eliminate unwanted noise. shift the frequency.
 addition of signals divide the voltage.

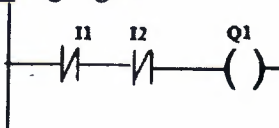
14. Ideal op-amp with negative feedback _____.
 increase the voltage difference between input and output.
 add input and output voltage.
 draw no current.
 draw high current.

15. What is the approximate output voltage of a 10-bit DAC with a 10.0 V reference if the input is $(0010110101)_2$.
 24.576 2.4576 17.675 1.7675

16. RTD is an _____.
 digital sensor analog sensor binary sensor level sensor

17. A tachometer is used to measure the _____.
 speed of an object level of an object
 presence of an object distance of an object

18. The ladder logic represents _____ logic gate.



- NAND AND NOT NOR

19. Which of the following is _____ an actuator.
- | | |
|-----------------------------------|--------------------------------------|
| <input type="checkbox"/> PLC | <input type="checkbox"/> SCADA |
| <input type="checkbox"/> solenoid | <input type="checkbox"/> bellow tube |
20. _____ is testing an instrument or device against a reference standard.
- | | |
|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> Programming | <input type="checkbox"/> Calibration |
| <input type="checkbox"/> Wiring | <input type="checkbox"/> Sensing |

KATHMANDU UNIVERSITY
End Semester Examination [C]
June/July 2024

Level : B.E.
Year : III
Time : 2 hrs. 30mins.

Course : COEG 304
Semester : I
F. M. : 40

02 JUL 2024

SECTION "B"
[5Q. × 8 = 40 marks]

Attempt *ANY FIVE* questions. Assume any suitable data if necessary.

1. a. What is a control system? Draw the block diagram of a closed loop control system and briefly explain the function of each block. [4]
- b. Find the transfer function, $G(s) = \theta_2(s)/T(s)$, or the rotational mechanical system shown in figure 1. [4]

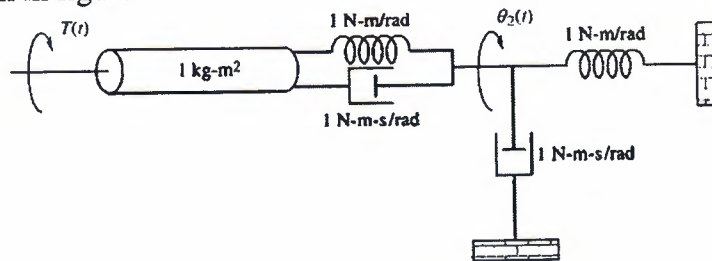


Figure 1: Rotational mechanical system

2. a. Simplify the block diagram to obtain the transfer function, $C(S)/R(S)$, for the system shown in figure 2. [4]

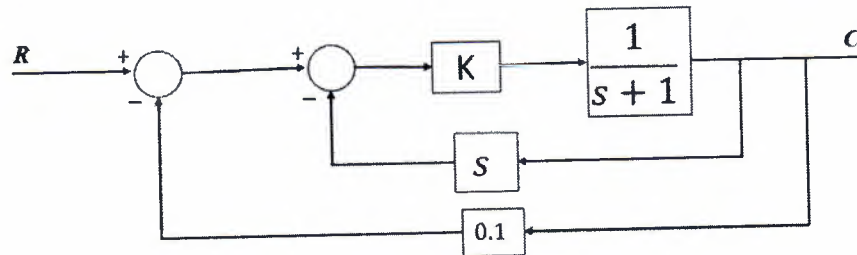


Figure 2: Block diagram of a system

- b. For the system shown in figure 3 (left), when subjected to a unit step input, the system responds as shown in figure 3 (right). Determine the value of K and T from the response curve. [4]

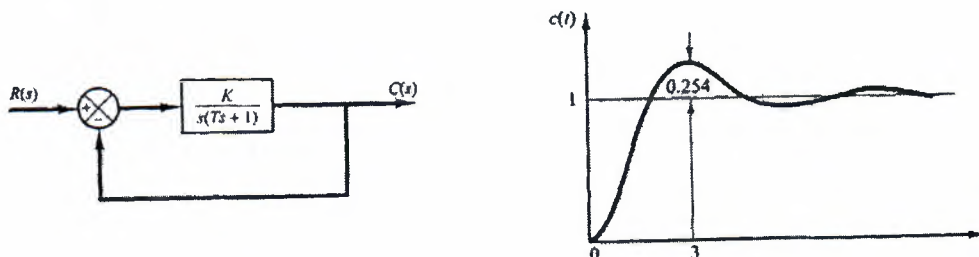


Figure 3: A closed loop system and its step response

3. a. Find the number of poles in the left half-plane, the right half-plane, and on the $j\omega$ -axis for the system with closed loop transfer function given by: [4]

$$T(s) = \frac{10}{s^5 + 2s^4 + 3s^3 + 6s^2 + 5s + 3}$$

- b. What is analog signal conditioning? Draw a neat diagram of 4-bit successive approximation ADC and convert an analog signal of 12.4V to digital with reference voltage of 16V. [4]
4. a. A process-control system specifies that temperature should never exceed 200°C if the pressure exceeds 20kPa. Design and draw an alarm system to detect this condition, using temperature and pressure transducers with transfer function of 5mV/°C and 0.5 V/kPa, respectively. [4]
- b. What is a Data acquisition system? Explain the elements of DAS and draw a basic block diagram for the Data Acquisition system. [4]
5. Let us suppose your research project is to monitor the weather around the KU vicinity. [8]
- Name any three sensors that you may incorporate.
 - Explain the working of the sensors that you have chosen.
 - Draw the block diagram of the whole system.
 - Explain if your system is a closed loop or open loop system.
6. a. What is SCADA? With the features of SCADA explain why SCADA is so popular in industry. [4]
- b. Write short notes on any two of the following statements. [4]
- Binary sensors.
 - The derivative or differential controller is never used alone.
 - Working of optical encoder.