15. (a) Explain strip tension controller.

Or

(b) Write a short note on automatic weighing system.

SECTION C — (3 × 10 = 30)

Answer any THREE questions.

16. Construct the block diagram of armature controlled dc motor.

17. Derive the expressions and draw the response of first order system for unit step input.

18. With neat diagram explain proportional mode pressure control system.

19. The transfer function of a control system is given by and plan the controllability and observability.

$$\frac{Y(S)}{U(S)} = \frac{(S+2)}{S^3+9S^2+26s+24}$$

20. Find the Laplace transform of

(a) $f(t) = 4t^3 - 5\sin 2t$

(b) $f(t) = \cos(t) + 2\sin(t)$

(c) $t^2 - 3t + 5$.

(For candidates admitted from 2016–2021 Batch)

B.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Part III — Electronics — Major

CONTROL SYSTEMS

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20)

Answer ALL questions.

1. Write Mason's gain formula.

2. Define open loop and closed loop systems.

3. What is transient and steady state response?

4. What are the effects of damping ratio on the time response of a second order system?

5. Define Laplace transform.

6. What is State space?

7. What is Controllability?

8. What is Observability?

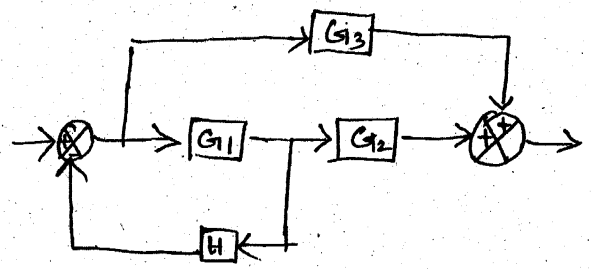
9. Write a note on Thermistors control of quench oil temperature.

10. List the parts used in strip tension controller.

SECTION B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b)

11. (a) Reduce the block diagram shown in below and find C/R.



Or

(b) Difference between open loop and closed loop system.

12. (a) Derive an expression to find steady state error of a closed loop control system.

Or

(b) The closed loop transfer function of a second order system is given by $T(S) = \frac{100}{s^2 + 10s + 100}$. Determine the damping ratio, natural frequency of oscillation, rise time, setting time and peak overshoot.

13. (a) Find the state space model for the system having transfer function

$$\frac{Y(s)}{U(s)} = \frac{1}{s^2 + s + 1}$$

Or

(b) Explain homogeneous state equation and non-homogeneous state equation.

14. (a) What is the difference between controllability and observability?

Or

(b) Check the controllability and observability

$$X = \begin{bmatrix} 2 & 0 \\ -1 & 1 \end{bmatrix} \cdot x + \begin{bmatrix} 1 \\ -1 \end{bmatrix} x;\ y = \begin{bmatrix} 1 & 1 \end{bmatrix} x$$