Ref No: SC/INSC/PG/CORE/TH/MI104A/2023

Name of the Examinations: **M.SC. Instrumentation 1st Year 1st Semester Examination 2023**

Subject: **Linear control System** Time: Two Hours Full Marks: 40

Instructions: Answer any four questions (all questions carry equal marks 10, part questions a & b carries equal 5 marks)

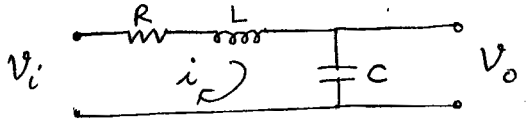
1.(a) With the help of block schematic diagram define the elements of a closed loop control system.

(b) Determine the stability of the following systems whose closed loop transfer functions are given by: (i) $T(s) = 5(s+1) / (s^3 + 3s^2 + 5s + 3)$, (ii) $T(s) = k / (s^3 + 5s^2 + 5s - 2)$.

2. (a) A closed loop control system has the characteristic equation given by $2s^4 + 2s^3 + s^2 + 3s + 2 = 0$. Check the stability of the system.

(b) Write short notes on any two: (i) DC servo motor, (ii) Tachogenerator,(iii) Gyroscope.

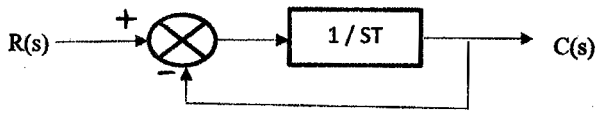
3. (a) Determine the transfer function of the network below:



(b) Obtain the mathematical expression of the closed loop transfer function in case of positive and negative feedback.

4.(a)With the help of graphical figure explain under damped, over damped and critically damped condition of a system. What are delay time response, rise time response and setting time response of a system.

(b) Obtain the response c(t) of the following 1st order system when a step signal in fed to its input. Determine the percentile steady state value the system will reach at time t = T & 4T.



5.(a) Obtain the unit step response of a unity feedback system whose open loop transfer function is $G(s) = 4 / s(s+5)$.

(b) A feedback system is described by the following transfer function $G(s) = 12 / (s^2 + 4s + 16)$; $H(s) = ks$. The damping factor of the system is 0.8. Determine the overshoot of the system & the value of k.

6. (a) Discuss phase margin and gain margin in context to stability of a system.

(b)Explain the proportional- plus- integral (PI) control mechanism of a control system.