MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM
(GOVERNMENT AIDED AUTONOMOUS ENGINEERING COLLEGE)
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

First Sessional Examination - August 2026
B24EE3T01 Linear Control System - S5 EA & EB

Time: 1.5 Hrs. Max Marks: 40

Answer all questions from Part A and Part B

Part A [4*3 =12 marks]

1. In a liquid-level control scheme, a human operator observes the level of liquid in a tank with the help of a float and regulates the inflow of liquid by adjusting a valve. Identify the components of the control system and construct its block diagram. **(CO1)**
2. Develop the transfer function of a phase-lag compensator from the RC network. **(CO1)**
3. For a unity feedback system with OLTF $G(s) = \frac{K}{(sT+1)}$, solve K for which the steady-state error is less than 10% when a step input is applied. **(CO2)**
4. Sketch the step response of an underdamped second-order system and label the transient response specifications. **(CO2)**

Part B [2*14 = 28 marks]

5.
a) Derive the transfer function of an armature-controlled DC motor and draw the block diagram. [8 marks] **(CO1)**

b) Obtain the transfer function of an RLC series circuit with voltage across the capacitor as output. [6 marks] **(CO1)**

6.
a) A first-order system is represented by $\frac{0.8}{0.5s+1}$. Determine the unit step response and calculate the time required for the output to reach
   (i) 63.2% of its final value
   (ii) 95% of its final value. [7 marks] **(CO1)**

b) Find the unit step response of a unity negative feedback control system whose open-loop transfer function is $G(s) = \frac{4}{s(s+3)}$ [7 marks] **(CO2)**

CO 1: *Students will be able to develop feedback control systems using the transfer function approach and explain the operation of controllers and phase compensators.*
CO 2: *Students will be able to analyse the transient and steady-state responses of first and second-order linear systems to standard test inputs, and determine their time-domain specifications and steady-state errors.*