REG.NO.:

VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act 1956)

SCHOOL OF ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST - I I
WINTER 2024-2025

SLOT: G1+TG1

Programme Name & Branch : B. Tech
Course Codeand Course Name : BECE302L Control Systems
Faculty Name(s) : BAGUBALI A, KATHIRVELAN J
Class Number(s) : VL202425050 0777/ 6548
Exam Duration : 90 minutes **Maximum Marks: 50**

Note: kindly use the normal graph sheet to solve the root locus numerical

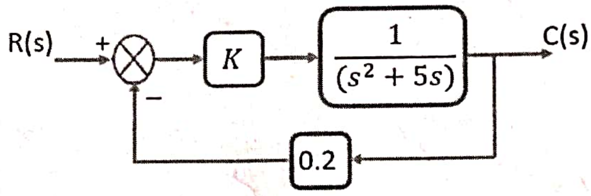
<table>
<tr><th>Q. No</th><th>Question</th><th>M</th><th>CO</th><th>BL</th></tr>
<tr><td>1</td><td>A feedback control system is shown in fig. 1. Determine the value of K so that the system will have a damping ratio of 0.5. Also for this value of K calculate maximum overshoot, settling time, and steady-state error for a unit ramp input.


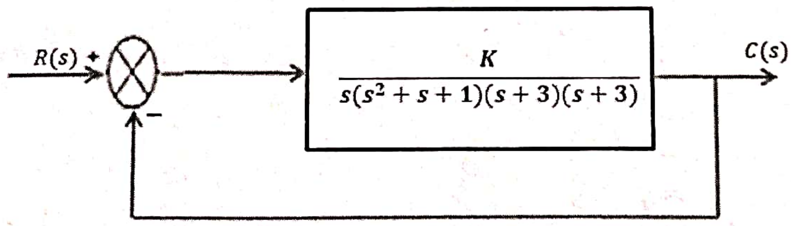
Fig. 1</td><td>10</td><td>2</td><td>3</td></tr>
<tr><td>2</td><td>For a unity feedback system having an open-loop transfer function $G(s) = \frac{K(s+2)}{s^2(s^2+7s+12)}$. Determine the following i) Type of system ii) Error constant k_p, k_v and k_a iii) Steady state error for a input $r(t) = 2 + t + t^2$.</td><td>10</td><td>2</td><td>3</td></tr>
<tr><td>3</td><td>A unity feedback control system is shown in Fig. 2. Using Routh's stability criterion, find the range of K for the system to be stable and also the frequency of sustained oscillations under limiting conditions


Fig. 2</td><td>10</td><td>3</td><td>4</td></tr>
<tr><td>4.</td><td>Sketch the root locus for a system having an open-loop transfer function is given by $G(s)H(s) = \frac{K(s+1)}{s^2(s+9)}$. Determine
a) The breakaway and break-in points
b) The Intersection of root locus with $j\omega$ axis
c) The angle of departure/arrival</td><td>10</td><td>3</td><td>3</td></tr>
<tr><td>5.</td><td>The open-loop transfer function of a unity feedback system is given by $\frac{K}{(S+2)(s+4)(s^2+6s+25)}$. By applying Routh's stability criterion, discuss the stability of the closed-loop system as a function of K which will cause sustained oscillations in the closed-loop system. What are corresponding oscillation frequencies?</td><td>10</td><td>3</td><td>4</td></tr>
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