Hall Ticket Number:

Code No. : 15437 S

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

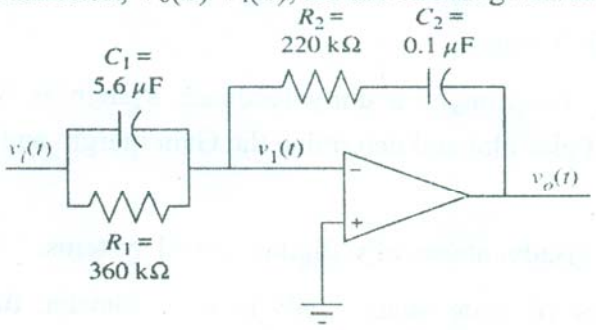
B.E. (E.C.E.) V-Semester Supplementary Examinations, July-2022

Control Systems Engineering

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	List the open loop applications of Control systems.	2	1	1	1
2.	Write the analogous electrical elements in force voltage analogy for the elements of mechanical translational system.	2	1	1	2
3.	What are the time domain specifications?	2	1	2	1
4.	Mention the limitations of static error constants.	2	1	2	2
5.	Explain the effect of adding zeros and poles to the transfer function of a control system.	2	2	3	2
6.	Define gain margin and phase margin.	2	1	3	1
7.	Draw the sampled data control system neatly with all details.	2	1	4	2
8.	Obtain the inverse z-transform of the function. $F(z) = \frac{z+1}{z^2+0.2z+0.1}$	2	2	4	2
9.	Describe State and State Variable.	2	1	5	2
10.	What is the need of controllability and observability tests?	2	1	5	2
	Part-B (5×8 = 40 Marks)				
11.a)	Distinguish between the open loop and closed loop in all respects.	4	2	1	3
b)	Find the transfer function, $V_o(S)/V_i(S)$, for the circuit given in Figure below: 	4	4	1	3
12.a)	Define type and order of the systems with suitable examples.	2	2	2	2
b)	Sketch the root locus for the unity feedback system whose open loop transfer function is $G(s) = \frac{K}{s(s^2+4s+13)}$.	6	4	2	2

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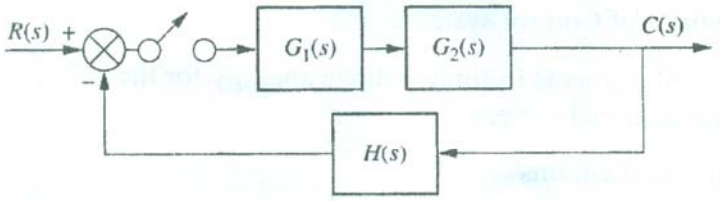
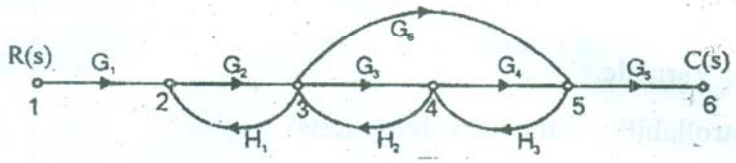
13.a)	Plot the Bode diagram for the following transfer function and obtain The gain and phase cross over frequencies: $G(s) = \frac{Ks^2}{(1+0.2S)(1+0.02S)}$.	4	4	3	4
b)	Explain about compensators used in control systems in brief.	4	3	3	3
14. a)	Describe the basic digital control system functionality with neat block diagram.	4	2	4	4
b)	Find T(z)= C(z)/R(z) for the system shown in Figure below: 	4	4	4	3
15.a)	Determine the controllability and observability of the system represented in the state space model as, $X' = \begin{bmatrix} x_1' \\ x_2' \end{bmatrix} = \begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} [u]$ and $Y = [0 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$.	6	4	5	4
b)	List the advantages of Sate Space representations.	2	2	5	3
16.a)	Using the Mason's gain formula find the transfer function of the system with signal flow graph shown in figure below: 	4	4	1	4
b)	Find the steady state error for an input signal $r(t) = 5 + 2t + \frac{t^2}{2}u(t)$ of a control system with unity negative feedback.	4	4	2	2
17.	Answer any ***two*** of the following:				
a)	The open loop transfer function of a unity feedback system is $G(s) = \frac{1}{S(1+S)(1+2S)}$. Sketch the Polar plot and determine the Gain margin and Phase margin.	4	4	3	4
b)	List the advantages and disadvantages of if digital control systems.	4	2	4	3
c)	Mention the advantages of state space analysis over transfer function method.	4	2	5	4

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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