Total No. of Questions : 8]

SEAT No. :

PD-4068

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[6402]-27
S.E. (Electronics /E&TC/Electronics & Comp. Eng./ Electronics Engg.(VLSI Design & Tech.)/Electronics & Comm.(A.C.T.))
CONTROL SYSTEM
(2019 Pattern) (Semester - IV) (204192)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume the suitable data, if necessary.***

Q1) a) Investigate the stability of the system with characteristics equation **[8]**
$G(s) = s^4 + 3s^3 + 2s^2 + 6s + 4 = 0$

b) A unity feedback system with open loop transfer function **[10]**

$$G(s) = \frac{k}{s(s+1)(s+3)(s+5)}$$. Sketch the root locus

OR

Q2) a) The unity feedback system has open loop transfer function **[8]**

$$G(s) = \frac{k}{s(s+2)(s+5)(s+10)}$$. Determine the range of 'k' for the system stability, value of 'k' and frequency of oscillation at marginal stability.

b) Plot a root locus for the system $G(s)H(s) = \frac{k}{s(s^2+6s+25)}$ **[10]**

Q3) a) The unity feedback system has open loop transfer function

$$G(s) = \frac{1}{s(s+1)(s+2)}$$. Sketch the Nyquist plot. Also Comment on Stability. **[9]**

b) Derive the expression for resonant peak (M_r) and resonant frequency (W_r) **[8]**

OR

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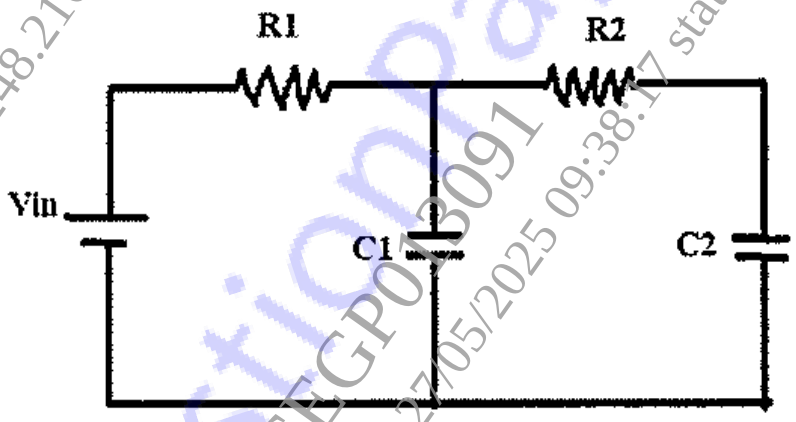
Q4) a) Draw Bode plot of the system with open loop transfer function : **[9]**

$G(s) = \dfrac{10}{s(s+2)(s+5)}$ and determine gain margin, Phase margin, Gain crossover frequency, Phase crossover frequency. Also comment on Stability.

b) The unity feedback system has open loop transfer function $G(s) = \dfrac{10}{(s+1)(s+5)}$, sketch the polar plot. Also find Y-intercept, gain crossover frequency and phase margin. **[8]**

Q5) a) Find the state model of the network **[9]**



b) Write the advantages of state space analysis over classical control. **[9]**

OR

Q6) a) Find transfer function of the system with state space model matrices **[9]**

$$A = \begin{bmatrix} -3 & -3 \\ 0 & -2 \end{bmatrix},\ B = \begin{bmatrix} 2 \\ 1 \end{bmatrix},\ C = \begin{bmatrix} 2 & 0 \end{bmatrix}$$

b) Determine the State transition matrix if $A = \begin{bmatrix} 0 & -2 \\ 1 & -3 \end{bmatrix}$ in $\dot{x} = Ax$. Also find $x(t)$ *if* $x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$. **[9]**

Q7) a) Explain ON-OFF control system with suitable example. **[9]**

b) How IoT helps in Industrial Automation? What are the essentials of an Industrial IoT solution? Give one examples of Industrial IoT. **[8]**

OR

Q8) a) Explain DCS with suitable block diagram and write advantages over analog system. **[9]**

b) Compare the Proportional mode, Integral mode and Derivate mode. **[8]**

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