***Q8)*** a) Compare Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM). **[7]**

b) Draw and Explain Block diagram of Adaptive Delta Modulation (ADM) and state the advantages of ADM over DM. **[7]**

***Q9)*** a) Explain the working Principle of Two-Way Radio Communication System (Walkie-Talkie). **[5]**

b) Draw and Explain the functional blocks of an Aviation Communication system. **[5]**

c) State any four real world applications of Two-Way Communication System. **[4]**

OR

***Q10)***a) Draw and Explain Block diagram of Basic Television System. **[5]**

b) Explain the functional blocks of Marine Communication System. **[5]**

c) Describe the use of communication systems in the following applications. **[4]**

i) Military and Defense Services

ii) Transportation and Navigation

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Total No. of Questions : 10]

SEAT No. :

**PF-12720**

[Total No. of Pages : 4

# [6625]-256
## S.E. (Electronics/E&TC)
## PCC-255-ETC : CONTROL SYSTEM
## (2024 Pattern) (Semester - IV)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***

***Q1)*** a) For a unity feedback system having open loop transfer function : **[6]**

$$G(s) = \frac{k(s+2)}{s(s^3+7s^2+12s)}$$

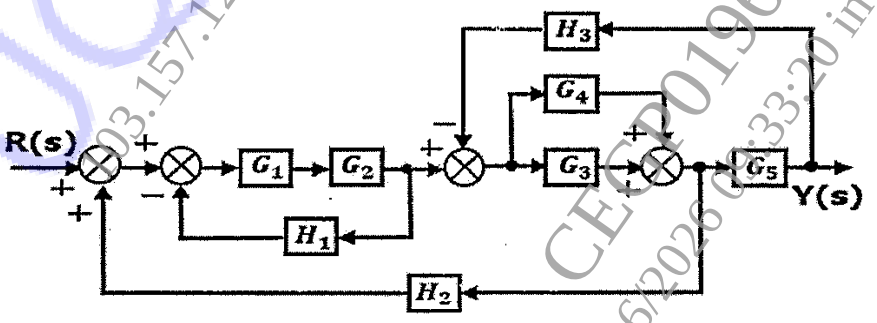
Find :

i) Type of system,

ii) Error coefficients,

iii) Steady state error when input to the system is $\frac{R}{2}t^2$.

b) Reduce the following block diagram into a single equivalent block using block diagram reduction techniques. **[8]**



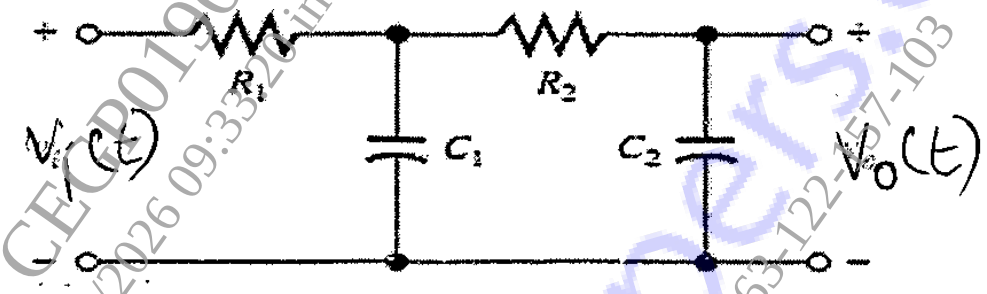

OR

***P.T.O.***

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***Q2)*** a) Draw the sketch of an under-damped second order system response with unit input excitation. Show the various specifications clearly on it and define them. **[6]**

b) Find the Transfer function $\frac{V_o(s)}{V_i(s)}$ for the following electrical sytem **[8]**




***Q3)*** a) Estimate the stability of system with the characteristics equation **[6]**

$$Q(s) = s^4 + 4s^3 + 6s^2 + 2s + 3$$

b) A unity feedback system has the loop transfer flinction, **[8]**

$$G(s) = \frac{k}{s(s+2)(s+3)(s+4)}$$

Determine: Breakaway points, intersection with imaginary axis. Plot Root locus. Comment on the stability.

OR

***Q4)*** a) Draw and discuss location of pole and its impulse response of first order system in 1) Stable system, 2) Unstable system, 3) Critically stable system. **[6]**

b) Using Routh's & Hurwitz's criteria, comment on the stability if the characteristic equation is : $Q(S) = S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S^1 + 16$ Check the system's stability and determine the number of closed-loop poles in the RHP of a plane. **[8]**

***Q5)*** a) For an Unity feedback System with open loop transfer function **[6]**

$G(S) = \frac{4}{s(s+2)}$ Determine

i) Damping factor,
ii) Undamped natural frequency,
iii) Resonant peak,
iv) Resonant frequency



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b) Draw Polar plot for $G(S)H(S) = \frac{5}{s(s+2)}$ **[8]**

Determine :

i) Gain Margin,

ii) Phase Margin,

iii) Gain crossover frequency,

iv) Phase crossover Frequency and comment on stability.

OR

***Q6)*** a) Define and explain **[6]**

i) Bandwidth,

ii) Gain Margin,

iii) Phase Margin,

iv) Gain crossover frequency,

v) Phase crossover Frequency,

vi) Resonant frequency

b) Draw Bode plot of the system with open loop transfer function **[8]**

$$G(S)H(S) = \frac{10}{s(s+2)(s+5)}$$

Determine :

i) Gain Margin,

ii) Phase Margin,

iii) Gain crossover frequency,

iv) Phase crossover Frequency and comment on stability.

***Q7)*** a) Obtain expression for state transition matrix and sate any four properties of state transition matrix. **[6]**

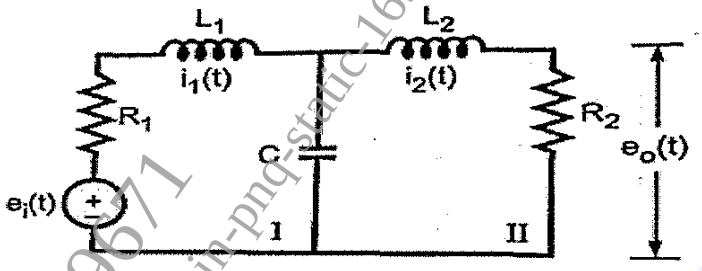
b) Obtain the controllable and Observable canonical state models for the system with transfer function $G(s) = \frac{s+3}{s^2+3s+2}$. **[8]**

OR



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***Q8)*** a) Obtain physical variable state model of system shown below **[6]**




b) Find the transfer function of **[8]**

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -4 & -7 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = [2\ 3]x$$

***Q9)*** a) Explain PLC with its block diagram and give details of each block. **[7]**

b) How IoT helps in Industrial Automation? What are the essentials of an Industrial IoT solution? Give one example of Industrial IoT. **[7]**

OR

***Q10)*** a) In an application of the Ziegler-Nichols method, a process begins oscillation with a 30% proportional band in an 11.5 min period. Find the nominal three mode controller settings. **[7]**

b) Explain Proportional mode, Integral Mode and Derivative Mode. **[7]**

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