Total No. of Questions :8]

SEAT No. :

P3184

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[5461]-223
B.E. (Electrical)
CONTROL SYSTEM-II
(Semester-I) (2012 Course) (403145)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

Answer any one question from each pair of questions: Q1 & Q2, Q3 & Q4, Q5 & Q6, and Q7 & Q8.

Q1) a) Draw important electrical networks used practically for the compensation for the control systems? **[8]**

b) A unity feedback system has an open loop transfer function. **[12]**

$G(s) = \dfrac{0.025}{s(1+0.5s)(1+0.05s)}$ Design a suitable Lag compensator so that phase margin is 40° and Kv=20/sec.

OR

Q2) a) Define and explain the terms: Eigen values, Eigen vectors, Diagonalisation and Vander Monde Matrix. **[8]**

b) Determine the state controllability and observability of the following system: **[12]**

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

Q3) a) State and explain various types of non linearities in control systems. **[8]**

b) A unity feedback control system with $G(s) = \dfrac{1}{s(s+1)(s+10)}$ includes ideal relay with output equal to ∓ 2 unit. Determine the amplitude and frequency of limit cycle by Describing function method. **[8]**

OR

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Q4) a) Explain Jump resonance and frequency entrainment for non-linear system. **[8]**

b) Derive the Describing function for Ideal Relay. **[8]**

Q5) a) Draw the block diagram of digital control system and explain the function of each block. **[8]**

b) Find the Z-transform of the sequence: **[10]**

i) $X(t) = e^{-at} \cos \omega t$

ii) $X(n) = (a)^n u(n-1)$

OR

Q6) a) Explain important properties of Z-transform. **[8]**

b) Find the inverse Z-transform of the function **[10]**

i) $X(z) = \dfrac{10Z}{(Z-1)(Z-0.2)}$

ii) $X(z) = \dfrac{Z}{(Z-1)(Z-2)}$

Q7) a) Define pulse Transfer Function. State general procedure for obtaining pulse Transfer Function. **[8]**

b) Obtain Direct realization of **[8]**

$$D(z) = \frac{Z^2 + 5Z + 2}{Z^3 + 6Z^2 + 4Z + 1}$$

OR

Q8) a) Write a short note on Digital PID Controller. **[8]**

b) Obtain Cascade realization of **[8]**

$$D(z) = \frac{Z^3 + 3Z^2 + 7Z + 5}{Z^3 + 3Z^2 + 9Z + 14}$$