

[6580]-571

B.E. (Electrical Engineering) (Insem)
ADVANCED CONTROL SYSTEM
(2019 Pattern) (Semester - VII) (403142)

Time : 1 Hour]**[Max. Marks : 30****Instructions to the candidates:**

- 1) Solve Q1 or Q2, Q3 or Q4.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Draw the circuit diagram of lag compensator and derive its transfer function. **[7]**

b) For a unity feedback system open loop transfer function is **[8]**

$$G(s) = \frac{k}{s(s+2)(s+30)}$$

Design a suitable lead compensator to satisfy the following specifications.

- i) Steady state error for unit ramp input ≤ 25
- ii) Phase margin = 25°
- iii) Gain Margin $\geq 8\text{dB}$

OR

Q2) a) Draw the lead network. What are the benefits of adding a lead compensator to a system? **[7]**

b) Design phase lag compensator for the system given by

$$G(s) = \frac{9600}{s(s+4)(s+80)} \text{ so that phase margin is } 33^\circ. \quad \text{[8]}$$

Q3) a) Explain the following terms with respect to nonlinear systems. **[7]**

- i) Limit cycle
- ii) Jump Resonance

b) Derive the mathematical expression for the describing function of an ideal relay. **[8]**

P.T.O.

OR

- Q4)** a) Explain any 3 non linearities with respect to their input output characteristics. [7]
- b) In unity feedback system an ideal relay with output equal to ± 10 unit is connected in cascade with [8]

$$G(s) = \frac{1}{s(s+1)(s+2)}$$

Determine amplitude and frequency of limit cycle if it exists by describing function method

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