

PRINCIPLE OF AUTOMATIC CONTROL
3K4-IET-21

Time : 3 hrs.

M.M : 100

Note :—

1. Part 'A' may be attempted in first 6 pages of Answer Sheet.
भाग 'क' के सभी उत्तर, उत्तर-पुस्तिका के प्रथम छः पृष्ठों में ही करने हैं।
2. Part 'B' in rest of the Sheets of Answer Sheet.
भाग 'ख' के उत्तर, उत्तर-पुस्तिका के अगले शेष पृष्ठों में लिखिये।
3. Answers may be given in English or Hindi.
प्रश्नों के उत्तर अंग्रेजी अथवा हिन्दी में दीजिये।

PART - 'A'**1. Attempt any ten questions**

(10x2=20)

- (a) What is pole?
- (b) Define control system.
- (c) Define self regulating system.
- (d) Define 'order' w.r.t to control system.
- (e) Compare feedback and feed forward control system.
- (f) What do you understand by single capacity process?
- (g) Differentiate between time variant and time invariant control system
- (h) Draw the polar plot of $G(S) = \frac{1}{S}$
- (i) Give an example of closed loop control system.
- (j) List the various components of open loop control system.
- (k) Explain what is routh array table?
- (l) What is bode plot?
- (m) What do you understand by stability of control system?
- (n) Define laplace transform.

2. Attempt any five question :

(5x4=20)

- (a) Explain the block diagram of closed loop control system.
- (b) What is the role of auxiliary eqⁿ in stability determination?

- (c) Find the closed loop transfer function of a system with forward transfer function $G(s)$ and feed back transfer function $H(s)$.
- (d) Derive the expression for response of 1st order system when unit step signal is applied.
- (e) The system characteristic equation is :

$$S^5 + 2s^4 + 4s^3 + 6s^2 + 2s + 5 = 0$$
 comment on stability using Routh's array method.
- (f) Define the various steady state errors.
- (g) Define the following
 (i) Bandwidth (ii) Phase Margin (iii) Gain crossover frequency.
- (h) Define timelag, deadtime hysteresis, and linearty.

PART- B

Attempt any three questions

(3x20=60)

3. (a) Derive the transfer function of mass spring damper thermometer?
 (b) List the advantages of closed loop system over open loop system.
4. Explain the terms in brief
 (i) Relative stability (ii) Gain Margin
 (iii) Phase crossover frequency (iv) Settling time
5. Define the following term.
 (i) undershoot (ii) peak time
 (iii) Fall time (iv) Maximum overshoot
 (v) damping Ratio
6. (a) Sketch the transient response of a 2nd order system and derive the expression of rise time and peak time.
 (b) How the bode plot for the system having can be drawn, write the steps?

$$G(S) = \frac{B0}{S(S+2)(S+20)}$$
7. (a) Briefly explain the root locus technique of stability of a control system.
 (b) Explain Routh stability criteria with the help of an example.