

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 Sheef.
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 : -**

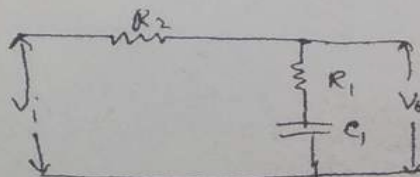
(10x2=20)

- (a) Which control system is more reliable open loop or closed loop? Justify your answer?
- (b) Define feedback in closed loop control system.
- (c) Define dead time.
- (d) Define transfer function.
- (e) Define Rise time?
- (f) List four stability factors for a any transfer function.
- (g) What is Ramp signal? Draw its characteristics.
- (h) What is relative error? Name the different relative errors.
- (i) Define Laplace transform.
- (j) What do you mean by second order system?
- (k) Define Gain Margin.
- (l) Give an example open loop control system.
- (m) What is dynamic response?
- (n) Explain desired value and feedback variable in control system.

2. Attempt any five questions :

(5x4=20)

- (a) Compare Linear and non linear control system.
- (b) Find the transfer function of the circuit given below:



- (c) Define :
 - (i) Resonance
 - (ii) resonant frequency
 - (iii) Half power frequency

- (d) Compare stable and unstable system.
- (e) Explain the transfer function of a single capacity process.
- (f) State the steps for drawing Root-Locus plot of a system.
- (g) Draw and explain unit step function.
- (h) Find Laplace transform of $\sin \omega t$.

PART- B

Attempt any three questions.

(3x20=60)

3. (a) What is the effect of a addition of a pole to the forward path transfer function?
 (b) Define polar plot. Find the polar plot of a unity feedback system with a pole at

$$\text{origin i.e. } G(S) = \frac{1}{S}$$

4. For the system having open loop transfer function :

$$G(S)H(S) = \frac{10}{S(S+1)(S+10)}$$

Determine the stability of the system using Root locus technique.

5. (a) Give example of 1st and 2nd order system.
 (b) Give practical example of open loop and closed loop system.

6. (a) The system characteristics equation is given by
 $S^5 + 2S^4 + 4S^3 + 6S^2 + 2S + 5 = 0$
 comment on stability using Routh array method.

- (b) Draw root loci of the control system with:

$$G(S)H(S) = \frac{K}{S(S+3)(S+6)}$$

obtain the value of K with $\zeta=0.6$ from root loci.

7. (a) Draw block diagram of control system and explain each block.
 (b) Sketch transient response of second order system and derive the expression of peak time.