

**EE-801 (GS)**  
**B.E. VIII Semester Examination, June 2020**  
**Grading System (GS)**  
**Control Systems**  
**Time : Three Hours**

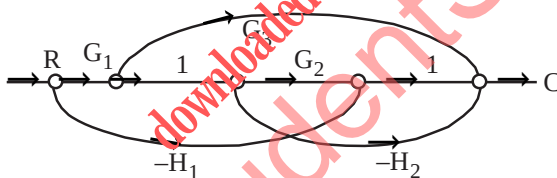
**Maximum Marks : 70**

**Note :** i) Attempt any five questions.  
 ii) All questions carry equal marks.

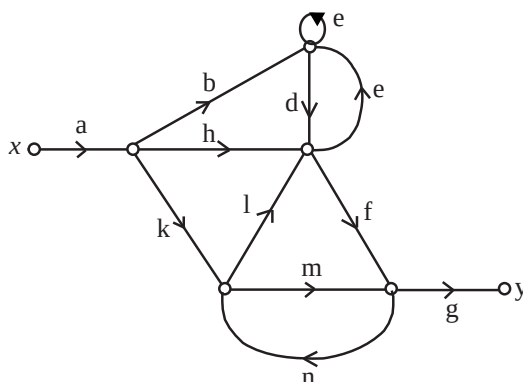
1. Derive the overall transfer function relating the output  $\Theta(s)$  and the input  $V_a(s)$  for armature controlled d.c. servo motor. Also give relation between torque constant  $K_t$  and back emf constant  $K_b$ .
2. Describe the relation between mechanical system with electrical system. What are the force voltage and force current analogy?
3. What is 'Breakaway points' and 'angle of asymptotes' in Root Locus. Determine both for the Open loop T.F.

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

4. Find the transfer function of a given system by Mason gain formula.



5. Determine the transfer function  $y/x$  by Mason's gain formula.



6. a) Plot the magnitude and phase angle plot of the following:

i)  $K$  (constant)

ii)  $s$

iii)  $\frac{1}{s}$

b) Sketch the Bode plot for the transfer function.

$$G(s) = \frac{50}{s(s+1)(s+2)}$$

Determine:

i) Gain cross over frequency

ii) GM and PM

iii) Stability

7. The open loop transfer function of a unity feedback control system is given by  $G(s) = \frac{k}{s(1+0.2s)}$ . Design a suitable compensator such that the system will have  $K = 10$  and P.M. =  $50^\circ$ .

8. Write short notes on any two:

a) A.C. servo motors

b) Synchro error detector

c) State space modelling

\*\*\*\*\*