

B.E. PRINTING ENGINEERING SECOND YEAR SECOND SEMESTER -2017

CONTROL APPLICATION IN PRINTING

TIME: 3 h

FULL MARKS: 100

ANSWER ANY FIVE QUESTIONS

(Use graph paper as required)

1. i. Consider a unity feedback control system with closed loop transfer function $T.F = \frac{ks+b}{(s^2+as+b)}$, Determine open loop transfer function. Show that steady state error in the unit step input response is given by $e_{ss} = \frac{a-k}{b}$. Also calculate k_p , k_v and k_a .

ii. Write short notes on any two:

a. Rise Time

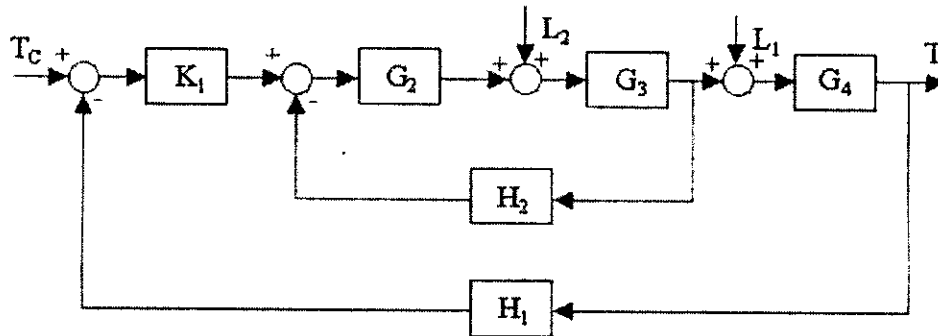
b. Peak Overshoot

c. Peak time

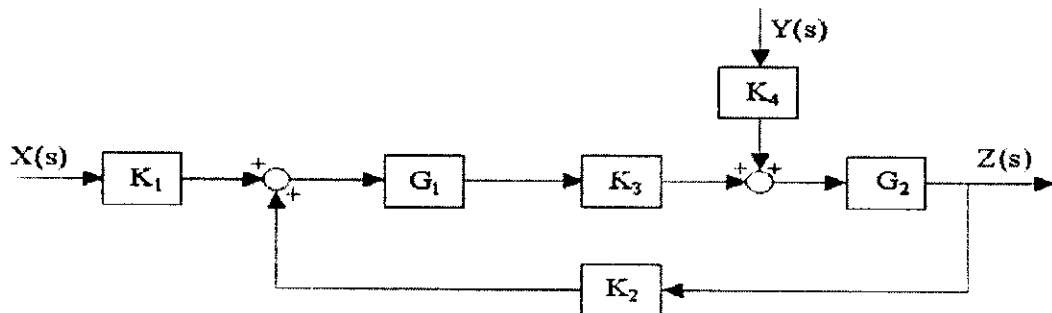
[10+10=20 marks]

2. Reduce the block diagram

a.



b.



[10+10=20 marks]

3. Write short note of the followings:

a. Different types of input signals in control systems

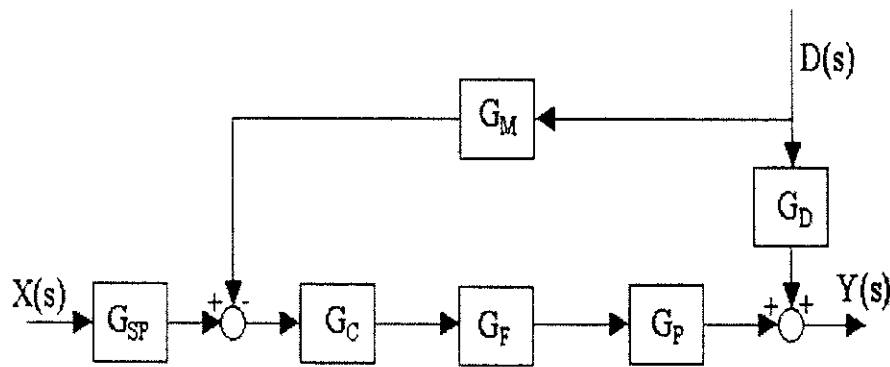
b. Rules of Block Diagram Reduction Technique

c. Field control dc motor

[6+6+8=20 marks]

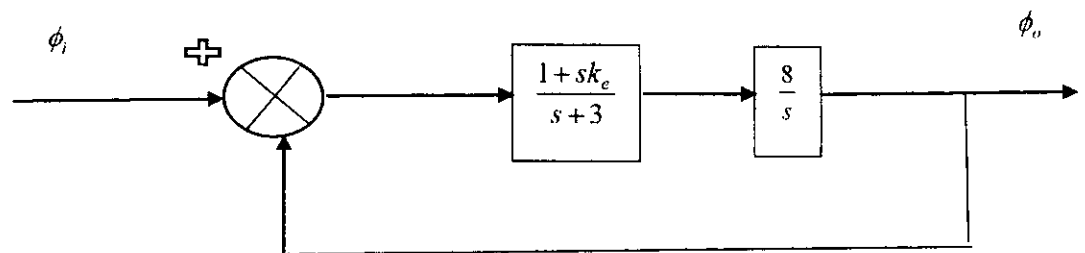
4.

- a. The open loop transfer function of a unity feedback system is given by $G(S) = \frac{k}{s(sT + 1)}$, where k and T are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 70% to 22.5%.
- b. Reduce the Block Diagram



[10+10=20 mark]

5. Determine the value of k_e so that damping ratio is 0.55. Also find the output response, peak time, maximum peak overshoot for step unit. [20 mark]



6.

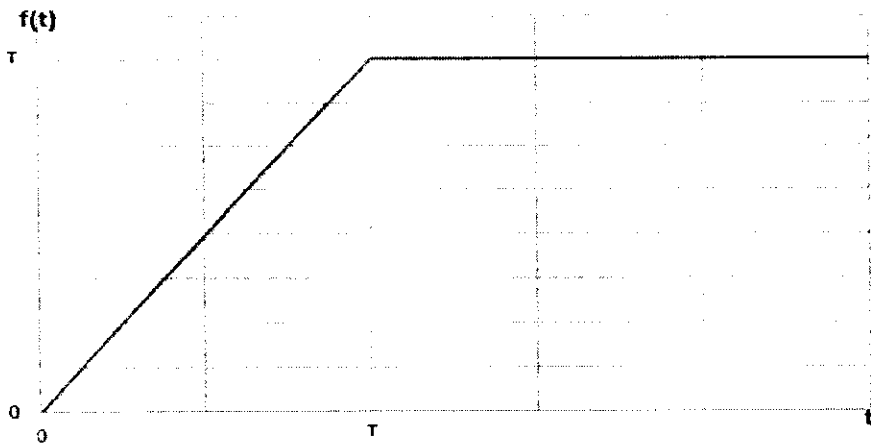
- a. For the system represented by the given equations. Find the transfer function $(\frac{x_5}{x_1})$, where x_1 is input variable and x_5 is output variable using Mason's gain formula.
- $$x_2 = a_{12}x_1 + a_{23}x_3 + a_{42}x_4 + a_{52}x_5$$
- $$x_3 = a_{23}x_2$$
- $$x_4 = a_{34}x_3 + a_{44}x_4$$
- $$x_5 = a_{35}x_3 + a_{45}x_4$$
- b. Obtain the solution of the differential equation using Laplace transformation:

$$\ddot{x} + ax = A \sin wt, x(0) = b$$

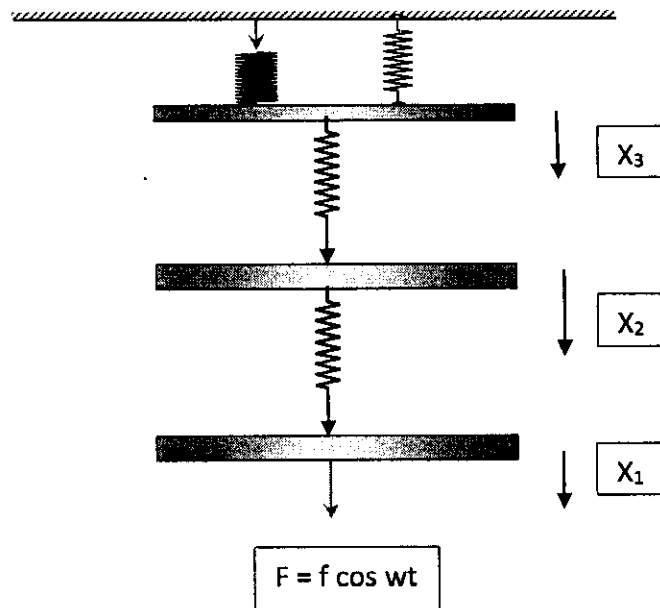
[12+8 =20 mark]

7.

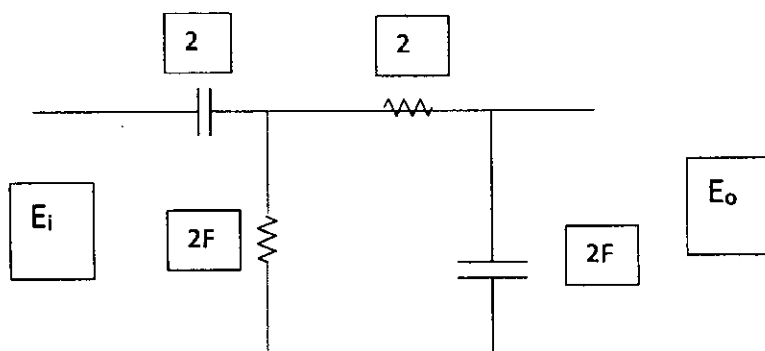
- a. Obtain the Laplace transformation of the waveform:



- b. For the given mechanical system draw the i) free body diagram, ii) f-v & f-i analogous circuit, iii) write the system equations of three systems. [6+14=20 marks]



8. a. Find the impulse response of the given circuit



- b. Using Block diagram reduction method find the transfer function [6+14=20 marks]
