

Course Code: EE411

Course Title: Control Systems I

Sheet #2

1- Construct the root-locus diagram of the following systems: ( $H(s)=1$ )

a)  $G(s) = \frac{K}{s(s+10)(s+20)}$

b)  $G(s) = \frac{K}{s^2(s+1)(s+5)}$

c)  $G(s) = \frac{K(s+3)}{s(s^2+4s+4)(s+5)(s+6)}$

d)  $G(s) = \frac{K}{s(s+2)(s+4)(s+10)}$

e)  $G(s) = \frac{K(s^2+2s+8)}{s(s+5)(s+10)}$

f)  $G(s) = \frac{K(s^2+4)}{(s+2)^2(s+5)(s+6)}$

g)  $G(s) = \frac{K(s+10)}{s^2(s+2.5)(s^2+2s+2)}$

2- Determine the value of K and the closed loop poles in Question (1) for the following cases:

- a) Damping ratio=0.707
- b)  $\tau=1$  sec
- c) Damped natural frequency=2
- d) Maximum overshoot=20%

3- Draw the root locus of the following system and determine the closed loop poles and the value of K for a damping ratio of =0.7

