**Arab Academy for Science and Technology & Maritime Transport**
**College of Engineering & Technology**
**Department :** Electrical power and computer control
**Course :** Control System I **Course No:** EE 411
**Lecturer :** Prof. Dr. Hassan Ibrahim
**TA :** Eng.

# Sheet (3)

1. A control system with unity feedback has the following forward T.F

$$G(s)=\frac{k}{s(0.1s+1)(\frac{1}{625}s^2+\frac{30}{625}s+1)}$$

   a) Draw the bode diagram for k = 1.
   b) Draw the bode diagram for k =10. Is the system stable in the two cases.

2. Draw the bode diagram representation for a unity feedback system

   a) $G(s)=\dfrac{1}{(0.5s+1)(2s+1)}$

   b) $G(s)=\dfrac{0.5s+1}{s}$

   c) $G(s)=\dfrac{30(s+8)}{s(s+2)(s+4)}$

   d) $G(s)=\dfrac{1000}{s(s+5)(s^2+10s+100)}$

   e) $G(s)=\dfrac{2(0.3s+1)}{s^2(0.1s+1)(0.5s+1)}$

3. A system has $G(s)=\dfrac{2(\tau_2 s+1)(\tau_3 s+1)}{s^2(\tau_1 s+1)(\tau_4 s+1)}$

   Where $\tau_1=4$ , $\tau_2=1$ , $\tau_3=0.5$ , $\tau_4=0.25$ sec

   Draw the bode diagram and determine the comer Frequency.

4. For a unity feedback system has a forward T.F $G(s)=\dfrac{4k}{s(s+2)}$

   It is required to compensate the system so that the static velocity $k_v=20\sec^{-1}$

   And the phase margin $\phi_m=50^o$.

5. For a unity feedback system has a forward T.F $G(s) = \dfrac{k}{s(s+1)(0.5+1)}$

   It is required to compensate the system so that the static velocity $k_v = 5\sec^{-1}$ and

   The phase margin $\phi_m = 40$.

6. Design a compensator for a type one system with an open loop T.F $G(s) = \dfrac{k}{s^2(0.2s+1)}$

   Such that :
   a) Velocity error constant $k_v = 10$
   b) Phase margin = 35

7. For a unity feedback system with an open loop T.F $G(s) = \dfrac{k}{s(10s+1)}$ , design a compensator

   Such that :
   a) Steady state error to a step input to be less than 5%.
   b) M.O.S.% is less than 15%.

8. A system has the following open loop T.F. $G(s) = \dfrac{k}{s(s+1)^2}$ Design a compensator

   Such that :
   a) Damping factor = 0.5
   b) Velocity error of no more than 10%