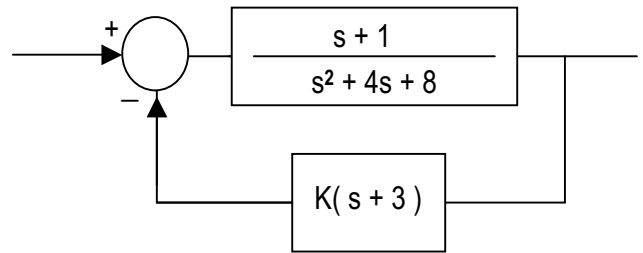


1

a ) Sketch the root locus for the system whose open loop transfer function is  $\frac{K(s-2)(s+4)}{(s^2+1)(s^2+4)}$   
Find **graphically** the value of k for which  $-2$  is a closed loop pole .

b ) Given the system shown in Fig.1

- Obtain graphically the unit step time response for the **open loop system** .
- Using the **angle condition** , is  $-3 + j2$  a closed loop pole ? If so , at what value of k is it so ?



**Fig.1**

2

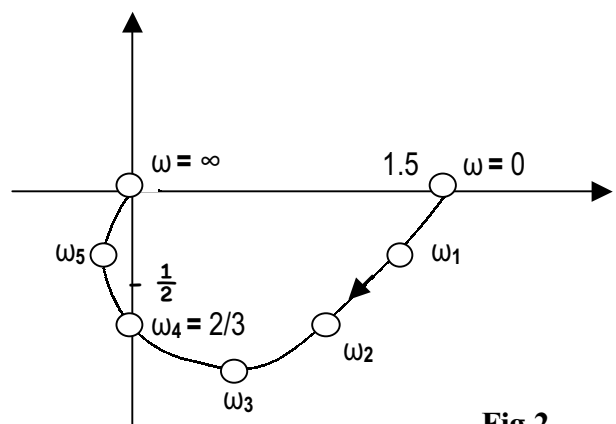
a ) Sketch the asymptotic Bode plot given  $G(s)$  as  $\frac{620(s+5)}{(s+2)^2(s+80)}$

Hence , **outline** how to obtain the Bode plot for  $0.01G(s)$  and for  $G(s)e^{4s}$  .

b ) What is meant by the frequency response .

c ) Obtain the **phase margin analytically** given  $G(s)H(s) = \frac{986}{s^2+5s+6}$

d ) The Nyquist diagram for a particular second order system is shown in Fig.2 .  
Obtain the transfer function given  $\omega_1, \omega_2, \omega_3, \omega_4$  and  $\omega_5$  are known .



**Fig.2**