B-8-1. The closed-loop transfer function is

$$\frac{C(s)}{R(s)} = \frac{10}{s+11}$$

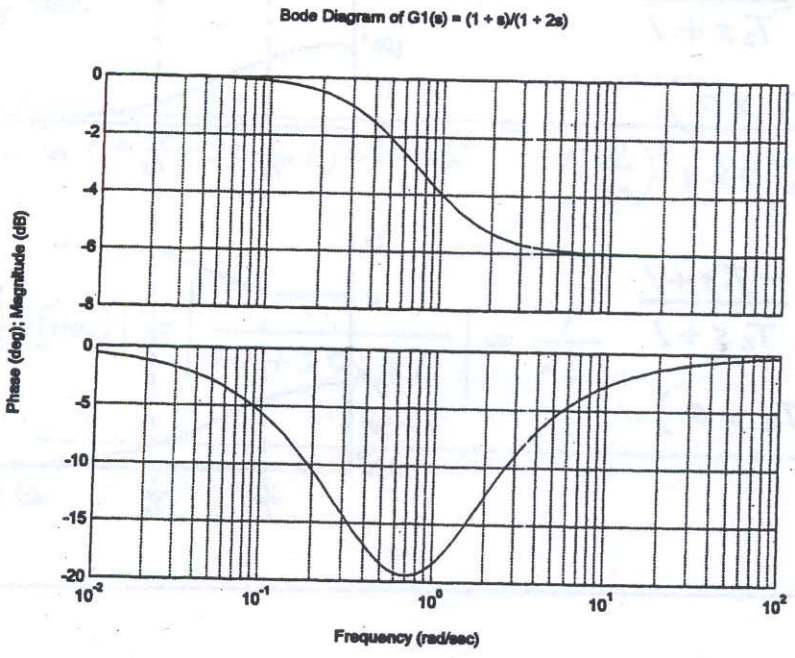
The steady-state outputs of the system when it is subjected to the given inputs are

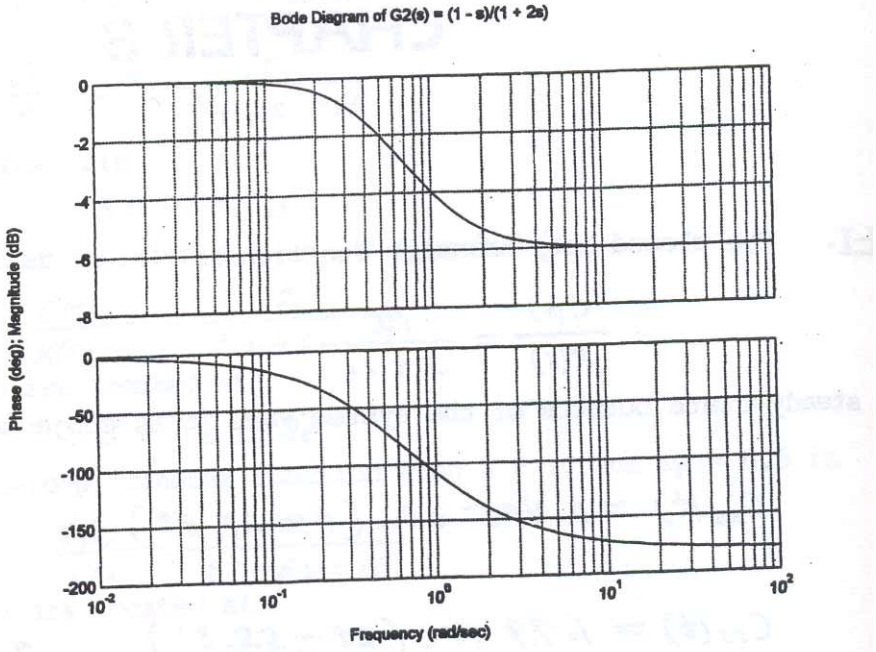
(a) $c_{ss}(t) = 0.905 \sin(t + 24.8°)$

(b) $c_{ss}(t) = 1.79 \cos(2t - 55.3°)$

(c) $c_{ss}(t) = 0.905 \sin(t + 24.8°) - 1.79 \cos(2t - 55.3°)$

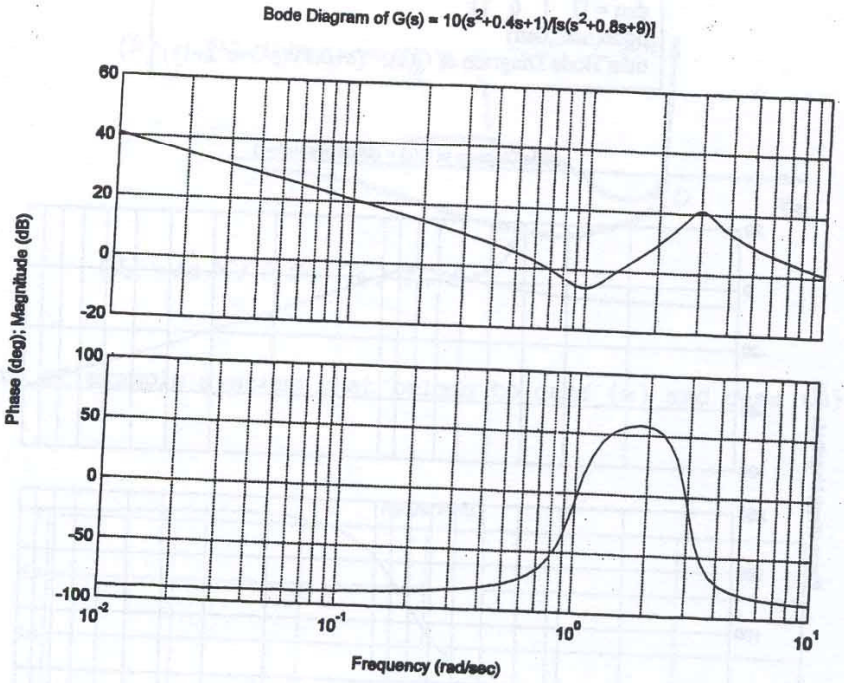
B-8-3.




Bode Diagram of G2(s) = (1 - s)/(1 + 2s)
Phase (deg); Magnitude (dB)
0
-2
-4
-6
-8
0
-50
-100
-150
-200
10^-2
10^-1
10^0
10^1
10^2
Frequency (rad/sec)

B–8–5. The following MATLAB program produces the Bode diagram shown below.

```
% ***** Bode diagram *****
num = [0  10  4  10];
den = [1  0.8  9  0];
bode(num,den)
title('Bode Diagram of G(s) = 10(s^2+0.4s+1)/[s(s^2+0.8s+9)]')
```



B–8–6. Noting that

$$G(j\omega) = \frac{\omega_n^2}{(j\omega)^2 + 25\omega_n(j\omega) + \omega_n^2} = \frac{1}{\left(j\frac{\omega}{\omega_n}\right)^2 + 25\left(j\frac{\omega}{\omega_n}\right) + 1}$$

we have

$$|G(j\omega_n)| = \left|\frac{1}{-1 + 25j + 1}\right| = \frac{1}{25}$$
