



**Sheet 3: Frequency Response**

Q1. Consider the unity-feedback system with the open loop transfer function:

$$G(s) = \frac{10}{s + 1}$$

Obtain the steady-state output of the system when it is subjected to each of the following inputs:

- (a)  $r(t) = \sin(t + 30^\circ)$
- (b)  $r(t) = 2 \cos(2t - 45^\circ)$
- (c)  $r(t) = \sin(t + 30^\circ) - 2 \cos(2t - 45^\circ)$

Q2. Given the transfer function  $G(s) = \frac{s+2}{s^2(s+1)^2(s+4)}$

Obtain the steady state output if the input is  $2\sin(t)$

Q3. Plot the bode and polar plot for the following Open Loop transfer function.

1.  $G(s) = \frac{5(s^2 + 1.4s + 1)}{(s-1)^2}$

2.  $G(s) = \frac{s-8}{s^2 + 6s + 8}$

3.  $G(s) = \frac{20(s+8)}{s(s+2)(s+4)}$