1. The polynomial \( a(s) = s^6 + 4s^5 + 3s^4 + 2s^3 + s^2 + 4s + 4 \) satisfies the necessary condition for stability since all the \( \{a_i\} \) are positive and non-zero. Determine how many, if any, roots of the system are in the RHP.

2. Consider a unity feedback system with feed-forward transfer function given as follows: \( G(s) = \frac{K(s + 1)}{s(s - 1)(s + 6)} \). Is the system open-loop stable? For what values of \( K \)? Is the system closed-loop stable? For what values of \( K \)?

3. Find the range of values of controller gains \( (K, K_I) \) so that the unity feedback system with controller given by \( K + K_I \frac{s}{s} \) and plant given by \( G(s) = \frac{1}{(s + 2)(s + 1)} \) is stable.

4. Find if any roots of the polynomial \( a(s) = s^6 + 3s^4 + 2s^3 + 6s^2 + 6s + 9 \) are in the RHP.

5. Find if any roots of the polynomial \( a(s) = s^6 + 5s^4 + 11s^3 + 23s^2 + 28s + 12 \) are on the imaginary axis or in the RHP.

6. Consider a unity-feedback system with the closed-loop transfer function given by \( \frac{C(s)}{R(s)} = \frac{Ks + b}{s^2 + as + b} \). Determine the open-loop transfer function \( G(s) \). Show that the steady-state error in the unit-ramp response is given by \( e_{ss} = \frac{1}{K_v} = \frac{a - K}{b} \).

7. Consider a unity-feedback system with open-loop transfer function given by \( G(s) = \frac{K}{s(Js + B)} \). Discuss the effects that varying the values of \( K \) and \( B \) has on the steady-state error in the unit-ramp response. Sketch typical unit-ramp response curves for a small, medium, and large value of \( K \), assuming constant \( B \).