1. A system has a transfer function, G(s) = 100/(s + 50). Find the time constant Tc, settling time Ts, and rise time Tr.
2. For the given transfer function , find the ζ and ωn, also characterize the nature of the response
3. For the system described by the transfer function

Find Tp, %OS, Ts, and Tr.

1. For the given the pole plot, find



-j5=-jωd

j5=jωd

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Description automatically generated

1. Find for a system whose transfer function is
2. Find the output response, c(t), for each of the systems shown in Figure. Also find the time constant, rise time, and settling time for each case.



1. Find the capacitor voltage in the network shown in Figure. If the switch closes at t = 0. Assume zero initial conditions. Also find the time constant, rise time, and settling time for the capacitor voltage.



1. For the system shown in Figure, (a) find an equation that relates settling time of the velocity of the mass to M; (b) find an equation that relates rise time of the velocity of the mass to M.



1. For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on)

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1. Write the general form of the capacitor voltage for the electrical network shown in Figure.



VC(s)/V(s) = 10s/(s2+20s+500).

Step response is 10/(s2+20s+500). The poles are at -10 + j20 and -10 - j20

1. Solve for x(t) in the system shown in Figure, if f(t) is a unit step.



1. For each of the second-order systems that follow, find **(Any 2)**



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| Q13 | | Reduce the system shown in Figure to a single transfer function, T(s) = C(s)/R(s)  Convert the block diagram in to signal flow graph. | |  | |
| Q14 | | Find the transfer function, T(s) = C(s)/R(s), for the system shown in Figure. Using Block diagram reduction method. | |  | |
| Q15 | | For the system shown in Figure, find the percent overshoot, settling time, and peak time for a step input if the system’s response is underdamped. Also justify that the response is underdamped. | |  | |
| Q16 | | For the system shown in Figure find the output c(t), if the input r(t) is a unit step. | |  | |
| Q17 | | For the system shown in Figure, find the closed poles  of the closed-loop transfer function, T(s) = C(s)/R(s). | |  | |
| Q18 | | For the system of Figure, find the value of K that yields 10% overshoot for a step input. | |  | |
| Q19 | | For the system shown in Figure, find K and α to yield a settling time of 0.15 second and a 30% overshoot | |  | |
| Q20 | | For the system of Figure, find the values of K1 and K2 to yield a peak time of 1.5 second and a settling time of 3.2 seconds for the closed-loop system’s step response. | |  | |
| Q21 | | Using Mason’s rule, find the transfer function,  T(s) = C(s)/R(s), for the system represented in Figure | |  | |
| Q22 | | Using Mason’s rule, find the transfer function,  T(s) = C(s)/R(s), for the system represented in Figure | |  | |
| Q23 | | Use Mason’s rule to find the transfer function of the system shown in Figure. | |  | |
| Q24 | | Use **block diagram reduction** to find the transfer function and compare your answer with that obtained by Mason’s rule. | |  | |
| Q.25 | | Find how many roots of the following polynomial are in the right half-plane, in the left half-plane, and on the jω-axis:  P(s) = s5 + 3s4 + 5s3 + 4s2 + s +3 | |
| Q.26 | | Find how many roots of the following polynomial are in the right half-plane, in the left half-plane, and on the jω-axis: | |
| Q.27 | | For the unity feedback system as shown    With    determine the range of K to ensure stability | |
| Q.28 | | Using the Routh-Hurwitz criterion, find how many roots of the following system are in the right half-plane, in the left half-plane, and on the jω-axis: | |
| Q.29 | | Use the Routh-Hurwitz criterion to find the range of K for which the following system is stable. | |
| Q.30 | | For the unity feedback system shown in Figure,    where    find the steady-state errors for the following test inputs: 25u(t); 37tu(t); 47t2u(t). | |
| Q.31 | | For the unity feedback system shown in Figure,    where    what steady state error can be expected for the test input 80t2u(t). | |

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| Q.32 | For the system shown in figure what steady state error can be expected for the following test inputs: 15u(t); 15tu(t); 15t2u(t) |
| Q.33 | For the system shown in Figure  a. Find Kp, Kv, and Ka.  b. Find the steady-state error for an input of 50u(t), 50tu(t), and 50t2u(t).  c. State the system type |
| Q.34 | The unity feedback system of Figure    where    is to have 1/6000 error between an input of 10tu(t) and the output in the steady state.  a. Find K and n to meet the specification.  b. What are Kp, Kv, and Ka? |