BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

II Semester 2019-2020

EEE/INSTR F242: Control Systems

Assignment

MM 25 Marks

B

Q1. Sketch the Nyquist plots for a system whose open loop transfer functions is $\frac{K(s+9)}{s^2(s+2)(s+11)}$ choosing the appropriate Nyquist contour. Determine the range of K for which the closed loop system is stable. Verify the same using MATLAB instructions. Also calculate Gain Margin expression in terms of K.

Q2. In a unity negative feedback control system, the transfer function of plant is $\frac{50}{s^2 - 20}$.

Design a Proportional (gain K) and Derivative output (gain K_t) controller to meet the following specifications:

Settling Time (for 5% tolerance band) ≤ 75 ms; Peak Overshoot ≤ 6%

Q3. Sketch root locus for a negative feedback systems whose open loop transfer functions is $\frac{K}{s(s^2+2s+9)}$ and therefrom determine the range of K for which the closed loop system is stable. Also verify the same using MATLAB instructions.

Q4. The open loop transfer function of a unity negative feedback system is $\frac{K(s+1)}{(5s+1)(s^2+2s+4)}$. Draw the Bode's plots so that steady state error is 20%. From the plots determine the gain margin & phase margin and comment on system stability. Also verify the same using MATLAB instructions.

Q5. Reduce the given block diagram using MATLAB instructions and get the transfer function C(s)/R(s).