Computers and Systems Eng. Dept. Third Year Automatic Control (CSE 3120)
Exam. 2 (HOME EXAM Degree:40 points 26-Dec. 2020

Question I (15 points)

A linear time-invariant control system has the given characteristic equation, check the stability of this system using Routh's table. Determine values of all poles.

$$(s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16) = 0.$$

Question II (25 points)

A Linear Time-invariant control system has the following open-loop transfer function:

$$KG(s)H(s) = \frac{K}{(s+1)(s+3)(s+5)}$$

(a)Plot the poles and zeros of the open loop transfer function.
(b)Indicate where the root locus resides on the real axis.
(c) Calculate the angles of the asymptotes and the intersection of the asymptotes.
(d) Find any breakaway points on the real axis.
(e) Find the angle of departure from any complex poles (if applicable).
(f) Find the points where the root locus crosses the $j\omega$-axis.
(g) Sketch the root locus.
(h) Compute the controller gain, K > 0, such that the dominant poles are critically damped and determine the corresponding values of the closed loop poles.

Good Luck Prof. M.Moness

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