JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T3 Examinations – December 2018

B.Tech V Semester (ECE)

Course Code: 10B1WEC515 Max.Marks: 35

Course Name: Theory and Application of control systems

Course Credits: 03 Max.Time: 2 Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume any missing data. Marks are indicated in parenthesis.*

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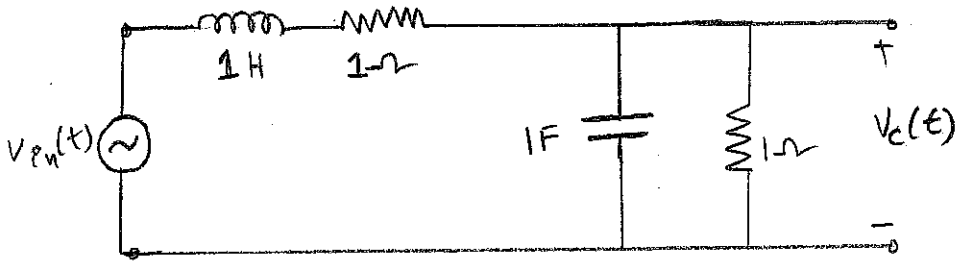
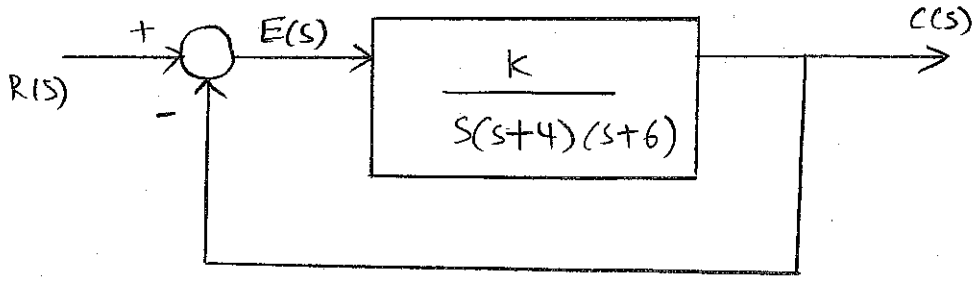
1. Find the state-space representation for the following system if $v_{in}(t)$ is input and $v_c(t)$ is output. Determine the controllability and observability of the system as well. (7 marks)



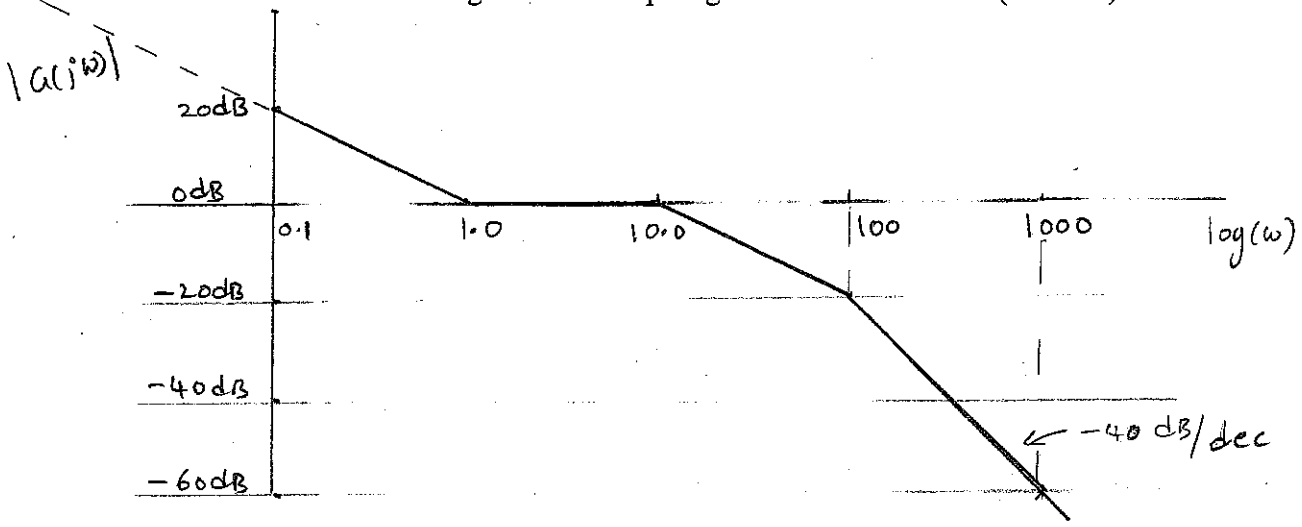
2. Using the Root-Locus, design an ideal derivative controller for the system to yield a 16% overshoot and a threefold reduction in settling time. (7 marks)



3. Describe the Nyquist stability criterion. Specify about the stability of closed loop system from Nyquist plot(no need to use graph paper), if open loop transfer function is $G(s) = \frac{k}{(s+1)(s+2)}$

(5 marks)

4. Derive the transfer function for the magnitude Bode plot given below. (5 marks)



5. Find the number of poles that are in the right half of the s-plane, on $j\omega$- aixs and in the left half of the s-plane if characteristic equation is $s^8 + 10s^6 + 35s^4 + 50s^2 + 24$. Specify about the stability of the system as well. (5 marks)

6. Write briefly about the following.

a. Steady state errors for different types of systems. (2 marks)
b. Masons's gain formula. (1 mark)
c. Gain margin and phase margin with respect to Nyquist plot (2 marks)
d. Location of poles with respect to un-damped, under damped transient response. (1mark)