JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B.Tech-III Semester (ECE)

COURSE CODE(CREDITS): 18B11EC311(3) MAX. MARKS: 35

COURSE NAME: Automatic Control Systems

COURSE INSTRUCTORS: Dr Rajiv Kumar MAX. TIME: 2 Hours

Note: *(a)There are five question. All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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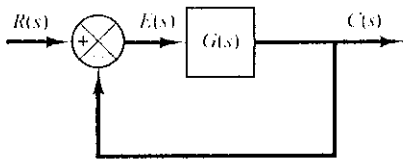
Q-1: a) For the following feedback system



Define position, velocity and acceleration error coefficients [3, CO-2]

b) For second order system, derive the expression of peak overshoot.

Also, explain that the peak overshoot does not depends upon natural frequency and it depends only on damping ratio. [3, CO-2]

Q-2: a) Construct the root locus of the system for which open-loop transfer function is

$$G(s)H(s) = \frac{K}{s(s+1)(s+2)}$$ [4, CO-3]

b) In part a, compute the following: centroid, angle of asymptotes and breakaway points. [3, CO-3]

Q-3: a) What is concept of frequency response? [1, CO-3]

b) What do you mean by the minimum-phase & non-minimum phase Systems? Explain giving one example of each. [2, CO-3]

c) Draw the graphical Bode plot of the following system on semilog-paper for which transfer

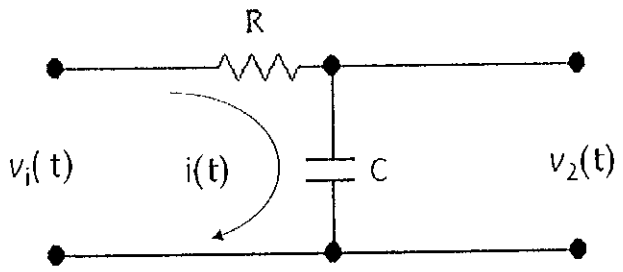
function is given below:

$$G(s) = \frac{20s}{(s+10)}$$ [4, CO-3]

Q-4: Draw the Bode Plot on semilog-paper and obtain the phase and gain margins of the system shown below corresponding to K=10 and K=100.

$$G(s) = \frac{K}{s(s+1)(s+5)}$$ [6, CO-5]

Q-5: a) Calculate the transfer function $G(s) = \frac{V_2(s)}{V_1(s)}$ of the following circuit:



[2, CO-1]

b) Explain the concept of stability, marginal stability and unstability with the help s-plan

[2, CO-1]

c) Consider the following transfer functions.

i) $G(s) = \frac{s+3}{s(s+2)}$

ii) $G(s) = \frac{s}{(s+1)(s+2)(s+3)}$

iii) $G(s) = \frac{(s+3)^2}{s(s^2+10)}$

iv) $G(s) = \frac{s^2(s+1)}{s(s+10)}$

(i) Determine whether the transfer function is proper or improper

(ii) Calculate the Poles and zeros of the system

(iii)Determine the order of the system

(iv)Draw the pole-zero map

(v) Determine the Stability of the system [5, CO-1]