KUMARAGURU
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B.E DEGREE EXAMINATIONS: DEC 2022

(Regulation 2018)

Fifth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U18ECT5004 **:** Control Systems

COURSE OUTCOMES

CO1: Apply techniques for system modelling (K3).
CO2: Analyze the systems in time domain (K3).
CO3: Demonstrate the frequency domain analysis of the system (K3).
CO4: Discuss various stability analysis techniques (K3).

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
**PART A (10 x 2 = 20 Marks)**
(Answer not more than 40 words)

1.	Contrast between open loop and closed loop system.	CO1	[K$_2$]
2.	Identify the basis for framing the rules of block diagram reduction technique.	CO1	[K$_2$]
3.	Why derivative controller is not used in control systems?	CO2	[K$_1$]
4.	What will be the nature of response of second order system with different types of damping?	CO2	[K$_1$]
5.	Recall the limitations of frequency response analysis.	CO3	[K$_1$]
6.	For a stable system the gain cross over occurs earlier than phase cross over. Justify your answer.	CO3	[K$_3$]
7.	What are asymptotes? How will you find angle of asymptotes?	CO4	[K$_1$]
8.	By Routh stability criterion determine the stability of the system represented by the characteristic equation, $7s^5-22s^4+8s^3-s^2-7s-8 = 0$. Comment on the location of roots of characteristic equation?	CO4	[K$_1$]
9.	What are the two situations in which compensation is required?	CO4	[K$_1$]
10.	List the effects and limitations of lag compensator.	CO3	[K$_1$]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
**(Answer not more than 400 words)**

11. a) Write differential equations governing the mechanical rotational system shown in Fig. below. Draw the electrical equivalent analogy circuits.   16   CO1   [K3]
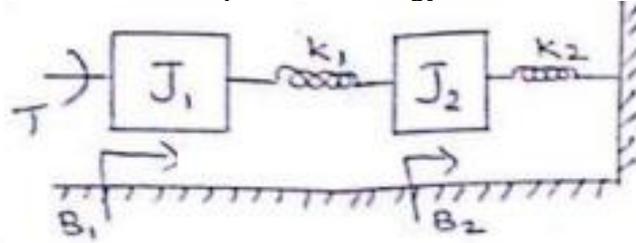
12. a) Derive the expressions and draw the response of first order system for unit step input.   08   CO2   [K$_2$]

b) With suitable block diagrams and equations, explain the following types of controllers employed in control systems: 08   CO2   [K$_2$]
    a) Proportional controller   b). PID controller

13. a) What is Steady-state error? Elaborate the procedure for calculating Steady-state error.   08   CO3   [K$_2$]

b) Find the rise time t_r, peak time t_p, maximum overshoot Mp, and settling time t_s of a second order system where ζ=0.6 and ω_n=5 rad/sec when the system is subjected to a unit-step input.   08   CO3   [K$_3$]

14. Obtain the phase and gain margins of the system shown below for the two cases K=10 and K=100. Using bode plot and identify the systems is stable or not.   16   CO3   [K$_3$]
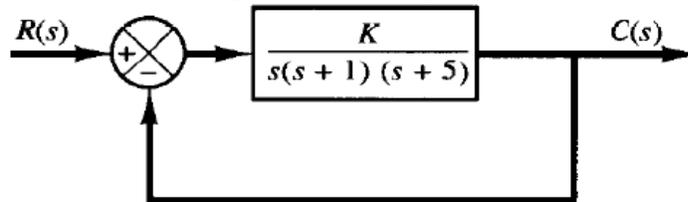
15 a) The open loop transfer function of a unity feedback system is given by   16   CO4   [K$_3$]

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

Sketch the polar plot and determine the gain margin and phase margin.

16. Elaborate the procedure of lead compensator using bode plot with an example.   16   CO4   [K$_3$]

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