

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2125)

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B. Tech 6th Semester Examination

Linear Control System (OS)

EC-6004

Time : 3 Hours

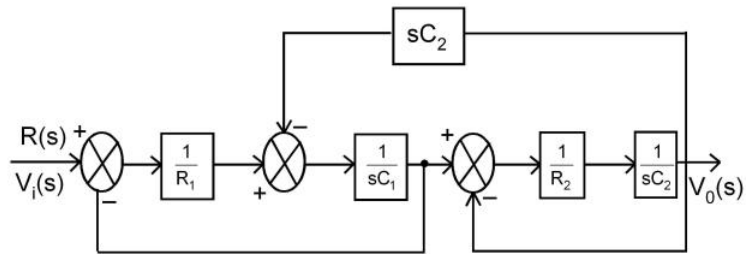
Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one question from each of the section A, B, C & D of the question paper and all the questions from Section E. Use of Non Programmable calculators is allowed.

SECTION - A

1. (a) Define closed loop system. Derive the equation for closed loop system in terms of forward path transfer function considering both type of feedbacks. (10)
- (b) Find the overall transfer function of the system shown below: (10)



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2. (a) Signal flow graph. State its properties. Show signal flow graph is constructed from the block diagram by taking any one example. (10)
- (b) Differentiate between feedback system and Non feedback system. State the advantages of using negative feedback over using positive feedback. (10)

SECTION - B

3. (a) Obtain the unit step response of a unity feedback system whose open loop transfer function is:
 $G(S) = 4 [S (S + 5)]$ (10)
- (b) Determine the step response of second order system. (10)
4. (a) Apply Routh Hurwitz criterion, determine the number of roots that lie in the right half plane of the following characteristics equation: (10)
 $S^6 + 6S^5 + 10S^4 + 12S^3 + 13S^2 - 24 = 0$
- (b) Sketch the root locii for the following:
 $G(S) = [K(S + 1)] / [S^2(S + 3.6)]$
 $H(S) = 1$ (10)

SECTION - C

5. Sketch the Bode plot for the following transfer function:
 $G(S) = 50 / [S(1 + 0.25S) (1 + 0.1S)]$
Determine
(i) Gain crossover frequency.
(ii) Phase crossover frequency.

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- (iii) Gain & Phase Margin.
- (iv) Stability of a given system. (20)
6. (a) Differentiate between time domain analysis & frequency domain analysis. Which is more advantageous in general life? (10)
- (b) The open loop transfer function with unity feedback is given by
- $$G(S) = K / [S(S+2)(S+4)]$$
- Determine the value of K so that M = 2. (10)

SECTION - D

7. (a) State various advantages of State Space Analysis. (5)
- (b) A system is Characterized by the following transfer function:
- $$Y(s) / U(s) = 2 / (s^3 + 6s^2 + 11s + 6)$$
- Find the state and output equation in the matrix form and also test the controllability and absorvability. (15)
8. (a) State the design procedure for Phase lag compensator. (10)
- (b) Write a short note on lead lag compensation. (10)

SECTION - E

9. Answer the following:
- (a) What is Masson's Gain formula?
- (b) Define characteristics equation for transfer function.

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- (c) State Routh Hurwitz criterion.
- (d) What is breakway point?
- (e) Define Relative and Absolute stability.
- (f) Define Eigen Values.
- (g) What do you mean by controllability?
- (h) Define State vectors
- (i) Find steady state error due to step input for Type -1 system.
- (j) State the advantage of positive feedback. (10×2=20)