JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- APRIL-2023

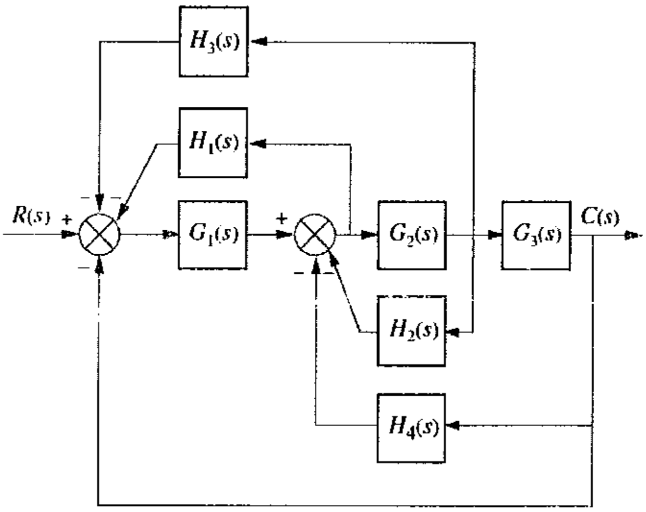
COURSE CODE(CREDITS): 18B11EC311(3) MAX. MARKS: 25

COURSE NAME: Automatic Control Systems

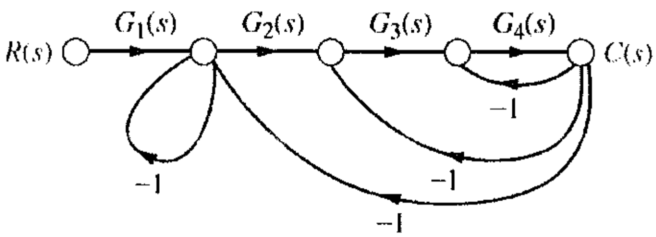
COURSE INSTRUCTORS: Dr. S R Talluri MAX. TIME: 1 Hour 30 Minutes

Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

1. Reduce the block diagram shown below to a single block representing the transfer function, $T(s) = \frac{C(s)}{R(s)}$ [CO-2 , Marks:4]



2. Using Mason's rule, find the transfer function, , $T(s) = \frac{C(s)}{R(s)}$ for the system represented below. [CO-2 , Marks:4]



3. Find the locations of the poles and zeros, plot them on the s-plane, and then obtain an expression for the general form of the step response solving for the inverse Laplace transform for $T(s) = \frac{20}{s^2+6s+144}$ [CO-3 , Marks:4]

4. Find the state-space representation in phase-variable form for the transfer function $\frac{C(s)}{R(s)} = \frac{24}{s^3+9s^2+26s+24}$ [CO-3 , Marks:4]

5. For the system with transfer function $\frac{C(s)}{R(s)} = \frac{16}{s^2+3s+16}$ of the second-order system, find damping ratio ζ; undamped natural frequency ω_n; settling time T_s ; peak time T_p; and percentage over shoot %OS. [CO-3 , Marks:4]

6. Define the following briefly. [COs-1 to 3 , Marks:5]
    a. Open loop system and closed loop system
    b. Negative feedback and positive feedback
    c. State space representation in matrix form with naming of each matrix
    d. Natural response and Forced response
    e. Critically damped and over damped response