(b) Draw the Bode plot for the phase lag network. [7]

• (c) Write a short note on lead-lag compensation. [7]

(d) Write the design procedure for phase lead compensation by using Bode plot. [7]

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324555(24)

BE (5th Semester)

Examination, Nov.-Dec., 2017

(New Scheme)

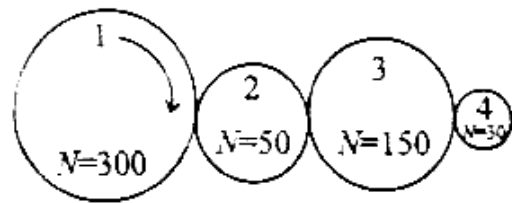## Control System Engineering

Time Allowed : 3 hours   Maximum Marks : 80
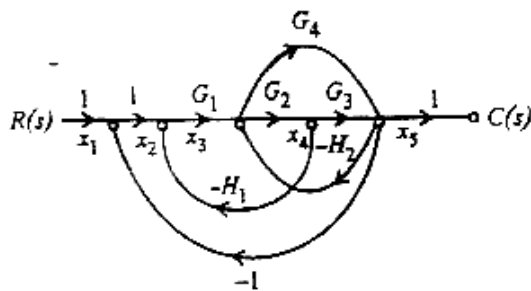
Minimum Pass Marks : 28

Note : (i) In each question part (a) is compulsory and answer any **two** from the rest.

(ii) The figures in the right-hand ~~~ indicate marks.

1. • (a) Define open-loop and closed-loop system. csvtuonline.com [2]

• (b) What are the effects of feedback on sensitivity ? [7]

• (c) What are the basic elements in thermal system and liquid level systems? [7]

(d) If $\theta_1 = 3$ rad (clockwise), calculate the displacement of wheel 2, 3 and 4 shown in figure.

If $\omega_1 = 15$ rad/sec, calculate ω_3 and ω_4.

If $T_1 = 10$ N-m, calculate T_2 and T_3.

If angular acceleration (θ''_1) for wheel (1) is 4 rad/sec², calculate θ''_3.

Find $r_1 : r_2$ and $r_1 : r_3$. [7]

N=300, N=50, N=150, N=30

2. (a) Define the term 'non-touching loops' with respect to a signal flow graph. [2]

(b) Obtain the transfer function of two-phase AC servomotor. [7]

(c) Explain the operation and advantages of pneumatic systems. [7]

(d) Draw the block diagram from the given signal flow graph : csvtuonline.com [7]

3. (a) What is meant by relative stability ? [2]

(b) Obtain an expression for the unit-step response of a second-order system. [7]

(c) Define the steady-state error and error constants with respect to unit step, unit velocity and unit acceleration inputs. How can the steady-state error be reduced ? [7]

(d) A feedback system has an open-loop transfer function

$$G(s)H(s) = \frac{Ke^{-s}}{s(s^2 + 5s + 9)}$$

Determine by use of Routh criterion, the maximum value of K for the closed-loop system to be stable. [7]

4. (a) What is a Bode plot ? [2]

(b) Define phase crossover frequency, gain crossover frequency, P.M. and G.M. with suitable diagrams. [7]

(c) Write the procedure to sketch the Bode plot. [7]

(d) Sketch the polar plot for

(i) $G(s) = \dfrac{1}{s}$;

(ii) $G(s) = \dfrac{1}{s^2}$;

(iii) $G(s) = \dfrac{1}{s+1}$. [7]

5. (a) What is the effect of phase lead network ? [2]