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B.Tech. 6th Semester (Electric Engineering)

Examination, May-2013

CONTROL SYSTEM ENGG.

Paper-EE-304-F

Time allowed : 3 hours] [Maximum marks : 100

- Note :** (i) *Question No. 1 is compulsory from Section A.*
- (ii) *Attempt four questions from remaining four sections selecting one question from each section.*
- (iii) *Use of non programmable calculator is allowed.*

Section-A

1. (a) What is a control system ? What are the two major types of control system ?
- (b) Why tachometer feedback is used in control system ?
- (c) Define sink and source in control system.
- (d) Which one is more stable and more accurate of closed loop system and open loop system ?
- (e) Define servomechanism and compensation.

5×4

(2)

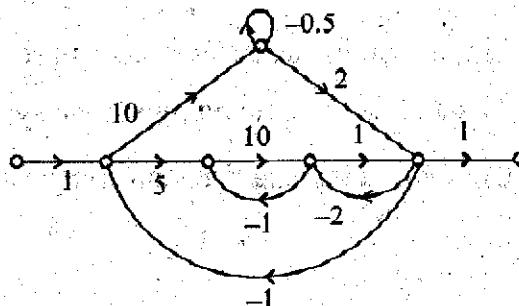
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Section-B

2. (a) Explain in detail : 10
(i) LTI and Time variant systems
(ii) Servomechanism
- (b) Discuss the impact of feedback on sensitivity to parameter variations in a system. 10
3. (a) Derive and explain D'Alembert's Principle. 10
(b) Explain a sampled data control system with the help of block diagram. 10

Section-C

4. A 12V battery is switched on to a series circuit comprising a resistance of 3 ohm, inductance of 1.2 H and capacitance of 0.6 F. Write the state equations in matrix form, if the initial charges on the capacitor is 1 coulomb and initial current is zero. (take simple series RLC circuit). 20
5. Determine $C(s)/R(s)$ using Mason Gain 20



(3)

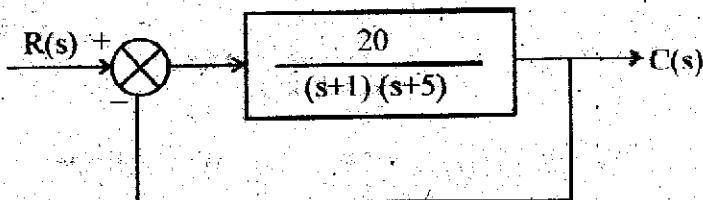
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Section-D

6. Sketch the root locus for $G(s) = \frac{K(s+2)}{s^2(s+4)(s+6)}$

Determine the value of K if the damping ratio is
to be 0.6. 20

7. Block diagram of a unity feedback control is
shown :



Determine the characteristic equation of the system,
 ω_n , ζ (damping ratio), ω_a , t_p and m_p the time at which the
first undershoot occurs. 20

Section-E

8. The open loop transfer function of a unity feedback
control system is given by :

(4.)

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$$G(s) H(s) = \frac{K (s+7)(s+42)}{s^3 (s+200)(s+1000)}$$

Discuss the stability of closed loop system as a function of K. Determine value of K which will cause sustained oscillations in the closed loop systems. What are the frequencies of oscillations ? Use Nyquist approach.

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9. Draw the bode plot for a system having

$$G(s) = \frac{5}{s(1+0.07s)(1+0.3s)}, H(s) = 1$$

Determine : (i) Gain crossover frequency and corresponding phase margin.

(ii) Phase crossover frequency and corresponding gain margin

(iii) Stability of the closed loop system.

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