Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

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[Total No. of Questions: 09] [Total No. of Pages: 02]

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Program: B.Tech. (Scheme 2018)
Semester: 4th
Name of Subject: Linear Control Systems
Subject Code: PCEC-109
Paper ID: 16225
Scientific calculator is allowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.

Part – A **[Marks: 02 each]**

Q1.

a) Define Nyquist stability criterion.

b) Cite any two methods to reduce steady state error.

c) List any four applications of control system.

d) Examine the stability of system $s^3+6s^2+12s+8$.

e) Explain why compensation is required in control systems.

f) Distinguish between feedback and feed forward control system.

Part – B **[Marks: 04 each]**

Q2. Explain the Mason's gain formula for the derivation of transfer function with a suitable example.

Q3. Derive the transfer function of field controlled DC servo motor and hence explain the system characteristics.

Q4. With the aid of diagram, describe the principle of operation of magnetic amplifier. Also, state its advantages.

Q5. Evaluate the restrictions on k so that the system whose transfer function is given below is absolutely stable.

$$G(s) = \frac{K}{S(1+0.5s)(1+0.1s)} \qquad H(s) = 1$$

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Q6. Obtain $\frac{C}{R}$ for Fig 1.

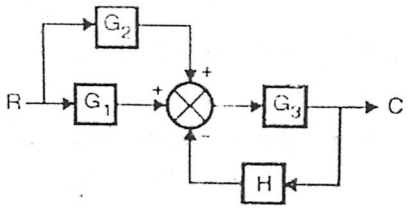

Fig 1.

Q7. Compute the output of first order system when the input applied is unit step. Also, sketch the r(t) and c(t) showing the steady state error.

Part – C

[Marks: 12 each]

Q8. Illustrate the features and control applications of Tachogenerators. Also, differentiate ac and dc Tachogenerators.

OR

Discuss in detail the following:

1. Lead compensator
2. Lag compensator

Q9. Compute the undamped natural frequency, damping ratio, damped natural frequency, rise time, peak time, peak overshoot and settling time with 2% criteria for a system having open loop transfer function given by: $\mathbf{G(s)\,H(s)} = \frac{16}{s(s+6)}$

OR

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

$$G(s)H(S) = \frac{K}{S(S+2)(s+5)}.$$

Sketch the root locus of the system and determine the value of K, for:

1. Critical damping
2. Marginal stability from the root locus

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