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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(ECE/Electronics & Electrical Engg.)**(2012 to 2017)****B.Tech.(EE/Electrical & Electronics Engg.) (2012 Onwards)****(Sem.-4)****LINEAR CONTROL SYSTEMS****Subject Code : BTEE-402****M.Code : 57105****Time : 3 Hrs.****Max. Marks : 60****INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A**1. Answer briefly :**

- a. What is control system? Why is it required?
- b. List the mechanical and electrical analogies.
- c. What do you mean by steady state error? Discuss.
- d. Explain the ramp and impulse test input signals.
- e. Differentiate between open-loop and closed- loop systems with examples.
- f. What is the significance of mathematical modeling?
- g. Why compensation is required? Explain.
- h. List the main characteristics of synchros.
- i. What do you mean by relative stability? Explain.
- j. What is rise time? Discuss its significance.

SECTION-B

2. Explain the following :
 - a. Linear and non-linear systems
 - b. Time-variant and time-invariant systems
3. Find the transfer function of the block diagram having two inputs ($X_1(s)$ and $X_2(s)$) and one output $Y(s)$.

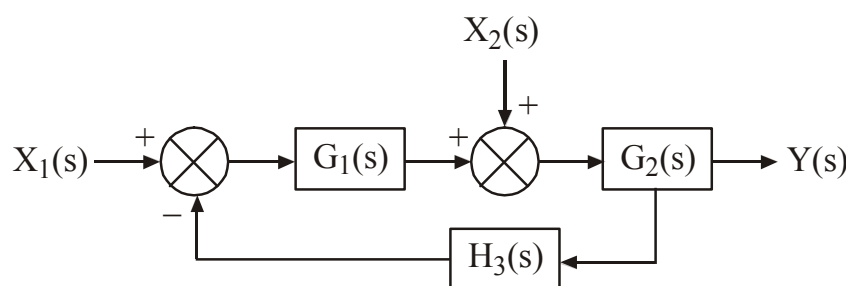


Fig.1

4. The characteristic equation of a feedback control system is given by

$$s^4 + 20s^3 + 15s^2 + 2s + K = 0$$

Determine the range of values of K for the system to be stable. Can the system be marginally stable? If so, find the values of K and frequency of sustained oscillation.

5. The open loop transfer function of a system is given by $G(s)H(s) = \frac{K}{s(2s+1)}$. Determine the stability of the system using Nyquist Criterion.
6. Find the open loop transfer function with proper explanation from the Bode Plot shown below :

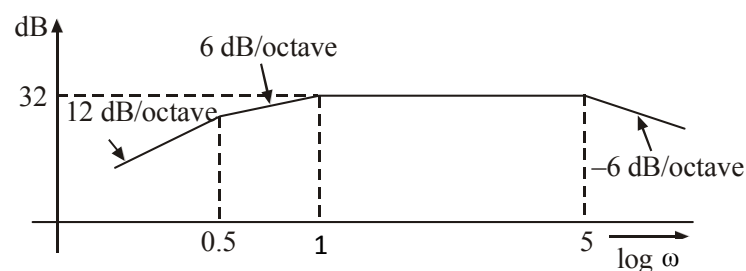


Fig.2

SECTION-C

7. A unity feedback system has an open loop transfer function $G(s)H(s) = \frac{K}{s^2(s+2)}$. By sketching the root locus plot, show that the system is unstable for all values of K.
8. Discuss the dynamic response of the first order system when :
 - a. Step input is applied
 - b. Sinusoidal input is applied
9. Discuss the following :
 - a. Lag compensation
 - b. Magnetic Amplifier

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.