

**II B. Tech II Semester Supplementary Examinations, Nov/Dec-2016**  
**CONTROL SYSTEMS**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **THREE** Questions from **Part-B**

**PART-A**

1. a) Why negative feedback is preferred in control systems. (3M)
- b) What do you mean by a signal flow graph? (3M)
- c) Name the standard test signals used in control systems and why are they needed. (3M)
- d) What do you mean by zero state response? (2M)
- e) Define the Phase cross over frequency. (2M)
- f) What is the requirement of gain margin and phase margin for a stable system? (3M)
- g) What is the basis for the selection of a particular compensator? (3M)
- h) What do you mean by decomposition of a transfer function? (3M)

**PART-B**

2. a) Compare in detail about Block diagram and signal flow graph methods. (8M)
  - b) Derive the transfer of AC servo motor. (8M)
  3. a) Explain the time response of under damped 2<sup>nd</sup> order system along with its transient response specifications (8M)
  - b) The open – loop transfer function of a unity feedback system is (8M)
- $$G(s) = \frac{8}{s(s+6)}$$
- Determine the nature of response of the closed – loop system for a unit – step input. Also determine the rise time, peak time, peak over shoot and settling time.
4. A unity feedback control system is characterized by the open loop transfer function (16M)
- $$G(s) = \frac{K(s+11)}{s(s+5)(s+9)}$$
- Using the Routh criterion
- i) Calculate the range of values of K for the system to be stable. ii) What is the marginal value of K for stability? Determine the frequency of oscillations if any
  - iii) Check for K = 1, all the roots of the characteristic equation of the above system have the damping factor greater than 0.5.
5. a) Explain the procedure to determine the gain margin and phase margin of a system from its Bode plot? (8M)
  - b) A feedback system has  $G(s)H(s) = \frac{100(s+4)}{s(s+0.5)(s+10)}$  Draw the Bode plot and comment on stability. (8M)



6. a) Derive the expression for the transfer function of a lead compensator. (10M)  
b) What are the effects of phase – lead compensation? (6M)
7. Write short notes on the following: (16M)  
(a) Controllability and observability  
(b) State transition matrix  
(c) Diagonalization

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