

**II B. Tech II Semester Supplementary Examinations, Dec/Jan-2015-16**

**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) Discuss about open loop system with an example (3M)
- b) What is a take off point or branch point? (3M)
- c) What does a time constant of a system indicate? (2M)
- d) What does the term 'type' of a system indicate? What is its significance? (3M)
- e) Define Phase margin. (3M)
- f) What are singular points? (3M)
- g) What are compensators? (2M)
- h) What are the advantages of canonical form? (3M)

**PART-B**

2. Derive an expression for the transfer function of an armature controlled DC servo motor (16M)
3. a) Derive expressions for the steady state errors of type – 0, type – 1 and type – 2 systems excited by a unit – parabolic input (6M)
- b) A system has the following transfer function (10M)  

$$\frac{C(s)}{R(s)} = \frac{20}{s+15}$$
 Determine its unit impulse, step and ramp response with zero initial conditions. Sketch their responses
4. a) Explain the Routh's criteria with an example. (8M)
- b) A system has  $G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+8)}$  Where K is positive. (8M)  
 Determine the range of K for stability.
5. a) List the advantages and limitations of Frequency response methods. (8M)
- b) Sketch the polar plot and discuss the stability of the system represented by (8M)  

$$G(s)H(s) = \frac{K}{s(s+1)(s+5)}$$
6. a) Derive the expression for the transfer function of a lag-lead compensator. (8M)
- b) Explain the design procedure of lag compensator (8M)
7. Given the system (16M)  

$$\dot{x}(t) = A x(t) + B u(t), Y(t) = C x(t)$$
 Where  $A = \begin{bmatrix} 1 & 1 \\ -2 & -3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ ,  $C = [1 \ 0]$   
 Determine the state controllability, output controllability and observability of the system