Code No: RT22026 **R13** SET - 1

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**

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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

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