B.TECH. (AEROSPACE ENGINEERING) (BTAE)

00384

Term-End Examination

June, 2014

BAS-020 : BASIC CONTROL THEORY

Time : 3 hours *Maximum Marks : 70*

Note : *(i) Attempt **any five** questions in all. **All** questions carries **equal** marks.*

*(ii) Scientific calculator is **permitted**.*

*(iii) Use of Graph paper & semi-log paper are **permitted**.*

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1. Given the transfer function **7+7=14**

$$G(S) = \frac{Y(S)}{R(S)} = \frac{1}{S^2 + 3S + 2}$$

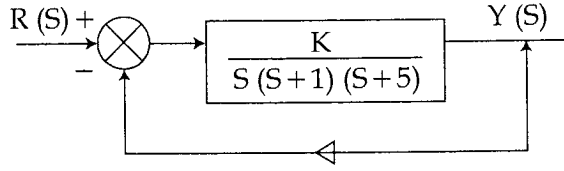
Find the response $y(t)$ to the input (a) $r(t) = 5\,\mu(t)$ (b) $r(t) = 5t\,\mu(t)$

2. Armature control of a dc motor is used in a closed-loop speed control of a system. Draw a schematic layout for the system. Also, describe the operation of main components used, explaining clearly how the error signal is formed. **14**

3. Using the Nyquist plot, determine Gain crossover frequency, Phase crossover frequency, Gain margin and Phase margin of feedback system with open loop transfer function **14**

$$G(S)\,H(S) = \frac{10}{S(1+ 0.2S)(1+ 0.02S)}$$

4. Use Bode plots to determine the stability of the system shown in fig below for the two cases **7+7=14**
(a) $K = 10$ (b) $K = 100$



5. Consider a unity feedback system with a forward path transfer function **14**

$$G(S) = \frac{K(S+4)}{(S+2)(S-1)}; \; K \geq 0$$

Draw a root locus plot and find the value of K that results in $\zeta = 0.707$ and $t_s < 4$ sec. Determine the peak overshoot, the settling time and the position error for this value of K.

6. (a) Define the error constants K_p, K_v and K_a. **7**
(b) Show that rise time, peak time and settling time measures of performance of a standard second order system are mutually dependent and, therefore must be specified in a consistent manner. **7**

7. Write short notes on **any two** of the following : **2x7=14**
(a) PID controller.
(b) Gain margin and phase margin.
(c) Open and close loop system.