Vasavi College of Engineering
Hyderabad-500 031.

Code No. 3152

FACULTY OF ENGINEERING

B.E. 4/4 (Prod.) I-Semester (Supplementary) Examination, June/July, 2011

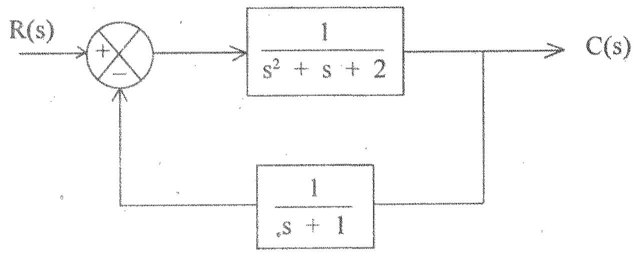
CONTROL SYSTEM THEORY

Time : Three Hours] [Maximum Marks : 75

Answer **ALL** questions from Part A. Answer any **FIVE** questions from Part B.

PART—A (Marks : 25)

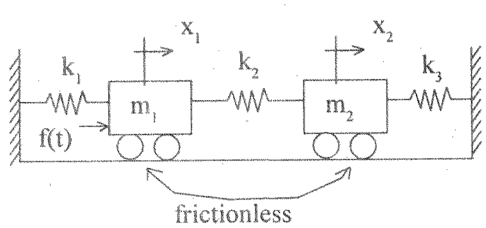
1. Find the Laplace transform of $e^{-2t} \cdot \sin 2t$. 2
2. What are the characteristics of negative feedback ? 3
3. For the system shown determine k_p and e_{ss} for unit step input. 3



4. State Routh-Hurwitz stability criterion. 2
5. Why do we use logarithmic scale for frequency in Bode plot ? 2
6. What is the effect of adding poles to G(s) H(s) on the root-locus ? 3
7. What is lead-compensator ? When it is preferred ? 3
8. Define phase and gain margin. 3
9. Define Controllability and observability. 2
10. What are the properties of STM ? 2

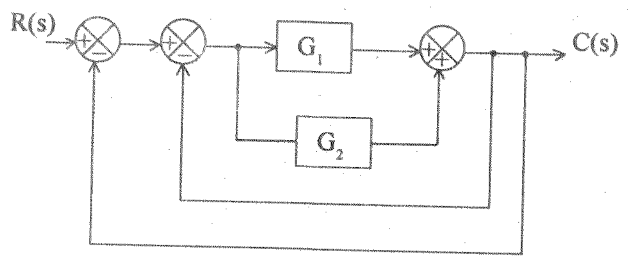
PART—B (Marks : 50)

11. Find the transfer functions, $\frac{X_1(s)}{F(s)}$ and $\frac{X_2(s)}{F(s)}$ for the following system : 10



12. Sketch the root-locus of the system with $G(s) = \frac{K}{(s-1)(s^2+4s+7)}$ and $H(s) = 1$. Show that the root-locus branches consist of st. lines. 10

13. Find the transfer function C(s)/R(s), using block diagram reduction : 10



14. Sketch the Nyquist plot and assess the stability of the closed loop system, whose open-loop transfer function is $G(s)H(s) = \frac{K(s+4)}{s^2(s+1)}$. 10

15. Design a lead compensator for the system with $G(s) = \frac{15}{(s+1)(s+3)(s+5)}$, such that steady-state error ≤ 2%, peak-overshoot ≤ 16%. 10

16. A linear time invariant system is described by :

$$\dot{x} = \begin{bmatrix} 0 & 6 \\ -1 & 5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y = [\,1 \quad 0\,]x, \quad x(0) = \begin{bmatrix} 0 \\ 0 \end{bmatrix},$$

obtain the output response y(t), t ≥ 0 for a unit-step response. 10

17. Write short notes on any **TWO** : 10

(a) Linearization of non-linear systems

(b) PID Controller

(c) Second order systems time domain specifications.