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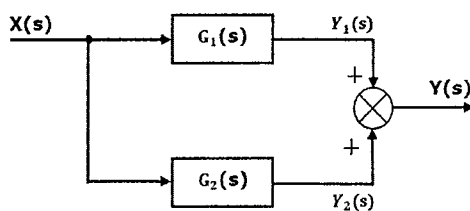
April 2024

Time - Three hours
(Maximum Marks: 100)

- [N.B. 1. Answer all questions under Part-A. Each question carries 3 marks.
2. Answer all the questions either (A) or (B) in Part-B. Each question carries 14 marks.]

PART - A

1. The transfer function of a open loop system $G(s)=1/(s^2(s+1))$. Find the type number and order of the system.
2. Define linear and non linear system.
3. Write the Mason's gain formula.
4. Find $Y(s)$ for the given block diagram



5. Draw step signal and write its mathematical definition.
6. Define positional error and velocity error constant.
7. What is phase margin?
8. Write the significance of polar plot.
9. What do you understand by unstable system?
10. What is centroid in root locus?

PART - B

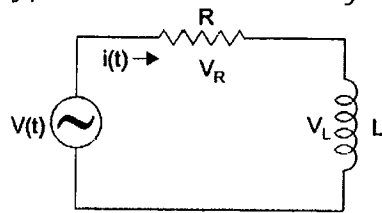
11. (a) (i) Find the laplace transform of (1) $f(t) = e^{-2t}t^2$ (2) $f(t)=\cos^2 3t$
(ii) Find the inverse laplace transform of the function

$$F(s) = (s+2)/(s^2+2s+5)$$

(Or)

[Turn over.....

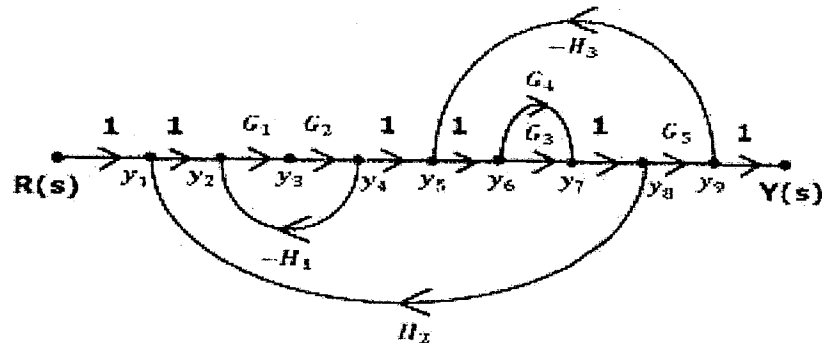
- (b) Find the transfer function of the given circuit and identify the type and order of the system



12. (a) Discuss about the rules for block diagram reduction with simple example.

(Or)

- (b) Find the overall gain of the given signal flow graph.



13. (a) Discuss about the first order and second order system in time domain analysis.

(Or)

- (b) For a unity feedback system, $G(s)=1/(s(1+s))$, the input is $r(t)=4+6t+2t^3$. Find the static error constants and steady state error.

14. (a) Sketch Bode plot for the given transfer function $G(s)=40/(s(1+0.1s))$. Determine the gain margin and phase margin.

(Or)

- (b) Sketch the polar plot and determine the gain margin and phase margin of $G(s)=20/(s(1+3s)(1+4s))$

15. (a) Using the Routh stability criterion, determine the location of roots on s-plane and hence the stability for the system represented by the characteristic equation $s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$

(Or)

- (b) Sketch the root locus of the unity feedback system whose open loop transfer function is $G(s) = K/(s(s+2)(s+3))$
