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**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (ECE) III Year I-Semester Main & Backlog Examinations, December-2017**

**Automatic Control Systems**

Time: 3 hours

Max. Marks: 70

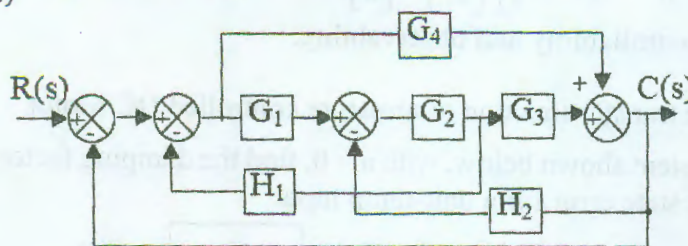
*Note: Answer ALL questions in Part-A and any FIVE from Part-B*

**Part-A (10 × 2 = 20 Marks)**

1. State Mason's gain formula.
2. How potentiometer can be used as error detector?
3. The open loop transfer function of a unity negative feedback control system is given by  $G(s) = \frac{ke^{-s}}{s(s+1)}$  find the range of 'k' for the closed loop system to be stable.
4. Closed loop transfer function of a unity feedback control system is given by  $\frac{1}{s^2+s+1}$  find the velocity error coefficient ( $K_v$ ) of the system.
5. Write short notes on Principle of argument.
6. What is the transportation lag system and how it effects on the stability of a system?
7. Find the transfer function of a zero order Hold circuit?
8. What are the implementation problems in digital control systems?
9. Obtain state model representation for a given system with differential equation  $\ddot{y} + 6\dot{y} + 11y + 6y = 6u$
10. State the properties of State Transition Matrix

**Part-B (5 × 10 = 50 Marks)**

11. a) Convert given block diagram into equivalent signal flow graph and find the transfer function  $\frac{C(s)}{R(s)}$  using Mason's gain formula. [5]



- b) For a given mechanical system shown in below find its transfer functions  $\frac{X_1(s)}{F(s)}$  and  $\frac{X_2(s)}{F(s)}$ . [5]

Also draw its equivalent electrical circuit using force – voltage analogy.

