Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, **HYDERABAD**
B.E. (E.E.E.) III Year I-Semester (Main) Examinations, Nov./Dec.-2016

Linear 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. Explain the differences between open loop and closed loop system.

2. Explain the terms sink node and feedback path.

3. Define the steady state error.

4. Define the marginal stability.

5. Explain the effect of adding poles on the stability.

6. Define gain cross over frequency.

7. Define State Transition Matrix.

8. State Kalman's stability analysis.

9. State the limitations of z-transform.

10. List the advantages of digital control system over analog control system.

Part-B (5 × 10 = 50 Marks)

11. a) Derive the Transfer Function for a.c. servomotor. [5]

    b) Determine the transfer function C(s)/R(s) for the following block diagram. [5]
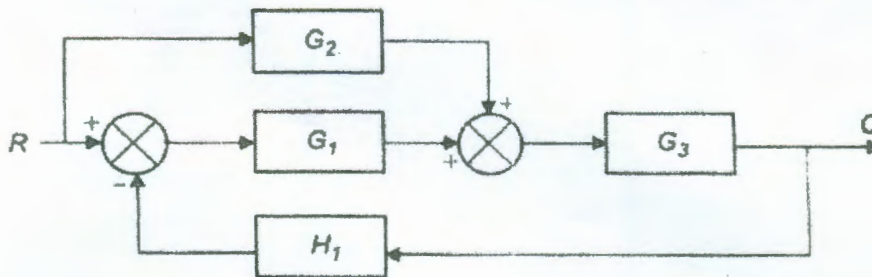
12. a) Derive the expressions for rise time, peak over shoot, settling time of 2nd order system. [5]

    b) A feedback system has an open-loop transfer function of $G(s) H(s) = K e^{-s} / s (s^2 + 5s + 9)$ [5]
    Determine using Routh criterion, the maximum value of K for the closed-loop system to be stable.

13. a) Sketch the root locus diagram for a feedback system the characteristic equation of which [5]
    is given by, $G(s)H(s) = K/s(s + 2)(s^2 + 2s + 2)$. Show clearly the steps involved.

    b) Briefly explain the correlation between time and frequency response of a system. [5]

14. a) Obtain the state equations in canonical form for transfer function given. [6]
    $Y(s)/ U(s) = (3s^2 + 5s + 13)/ (s+2) (s^2 + 4s + 8)$.

    b) What are the properties of state transition matrix? [4]

15. a) Explain Jury's stability criterian for sampled data control system using suitable example.   [5]

     b) Obtain the Z –transform of $f(t) = t^2$ [5]

16. a) Explain in brief about Synchros.   [4]

     b) A unity feed-back system has $G(s) = 40(s+2)/s(s+1)(s+4)$:   [6]

        Determine   *i)*   Type of the system

                      ii)   All the error coefficients.

17. Write short notes on any *two* of the following:

     a)   Gain margin and Phase margin.   [5]

     b)   Transfer function of ZOH circuit.   [5]

     c)   Advantages of state space analysis.   [5]

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