MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC601 Control System & Instrumentation

UPID : 006637

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer *any ten* of the following : [1 x 10 = 10]

(I) What is natural frequency of oscillation?

(II) Control system uses _____ feedback.

(III) What is zeta in time response?

(IV) In principle of Argument 'P' stands for _____.

(V) What is state space?

(VI) A _____ is a closed trajectory in phase space having the property that at least one other trajectory spirals into it.

(VII) Frequency response of a RC circuit can be obtained from _____ analyzer.

(VIII) Standart 2nd order closed loop system can be expressed as _____.

(IX) Steady state error is eliminated by _____controller.

(X) What are the general mathematical expression of quardratic roots?

(XI) $e^{-}_{\tau s}$ introduces _____ in the system.

(XII) The state of the network at time t=0 is specified by the inductor current and capacitor voltage. The state space representation will be homogeneous or nonhomogeneous?

Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

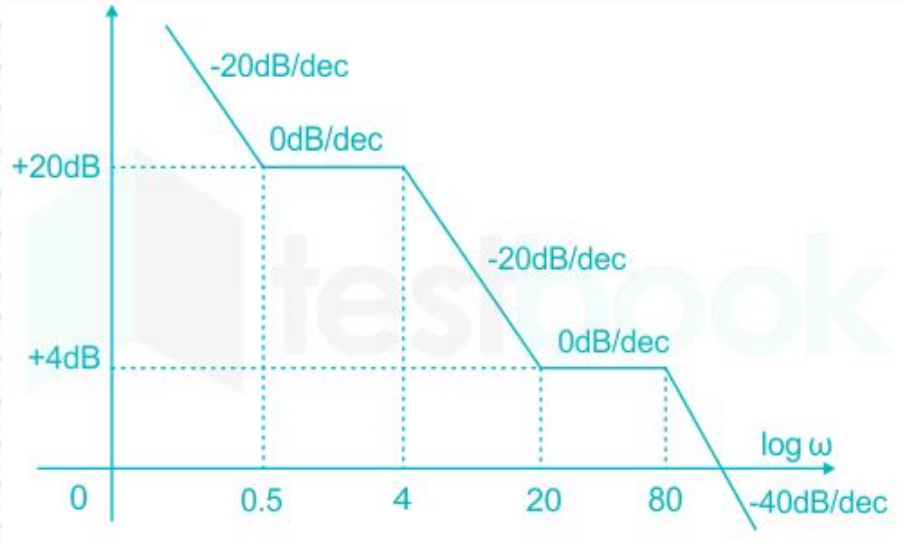
2. What is rise time of a 2nd order underdamped system.Find its expression. [5]

3. Explain gain and phase margin. [5]

4. $\frac{s^2+3s+1}{s^3+2s^2+3s+1}$Obtain State model. [5]

5. Expain the function of tacho generator. [5]

6. Find Tnansfer function of the following Bode plot. [5]



Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. (a) If energy storage element is present in nonlinear element what is the characteristic of the decribing function? [5]

   (b) Explain the requirement of Describing function method? Obtain the generalized expression for describing function for a given non linear element. [10]

8. (a) What is a CRO? Draw an label each part of CRO. [8]

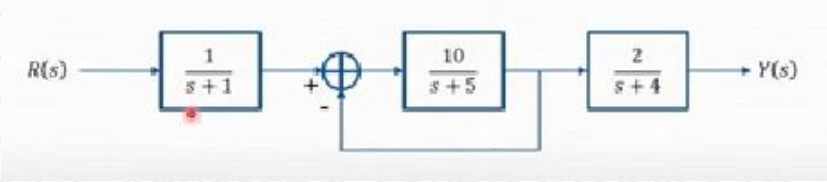
   (b) Explain briefly all the parts of CRO. [7]

9. (a) Explain the sufficient and neccessary conditions for Routh Stabilty criteria. [5]

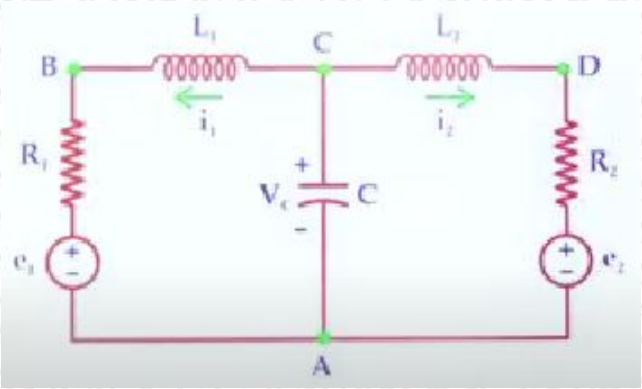
   (b) Discuss the importance of characteristic equation. [5]

   (c) Examine the stability of the following system:$s^5 + 2s^4 + 3^3 + 6s^2 + 2s + 1 = 0$ [5]

10. (a) Obtain State space representation in phase variable form [8]



   (b) Obtain State model of the following system [7]



11. (a) Obtain transfer function of a simple RC circuit without initial condition. [5]

   (b) What is the order of the system. What is its type? Can you determine the time constant from the output response curve of the RC Circuit? How system response is affected by the Time constant? [5]

   (c) How physical model is developed? What is difference between physical and mathematical model? [5]

*** END OF PAPER ***