

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3988

Roll No.

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B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2011-12

ELECTRICAL MACHINES & AUTOMATIC CONTROL

Time : 3 Hours]

[Total Marks : 100

Note : Attempt **all** Sections.

Section – A

1. Answer **all** the questions. Each question carries **2** marks.
 - (a) Define efficiency and voltage regulation of a Transformer.
 - (b) What are the different losses in DC Motors ?
 - (c) Draw the torque slip characteristics of Three phase induction motor.
 - (d) Write the applications of servo motor.
 - (e) What are the types of test signals ? And explain the importance of test signals.
 - (f) Write the analogous electrical elements in force-voltage analogy for the linear mechanical systems.
 - (g) What are the types of Error Constants ?
 - (h) Using Routh Criterion determine the stability of the system represented by characteristic equation $s^4 + 8s^3 + 16s^2 + 5 = 0$.
 - (i) What are asymptotes ? How will you find the angle of asymptotes ?
 - (j) Define P, PI and PID Controllers.

Section – B

2. Answer any **three**. Each question carries **10** marks :

- (a) Explain in detail Open Circuit test and Short Circuit test of a single phase transformer.
- (b) Explain the construction of Induction Motor in detail.
- (c) Determine the transfer function $C(s)/R(s)$ for the system shown in Fig. 1

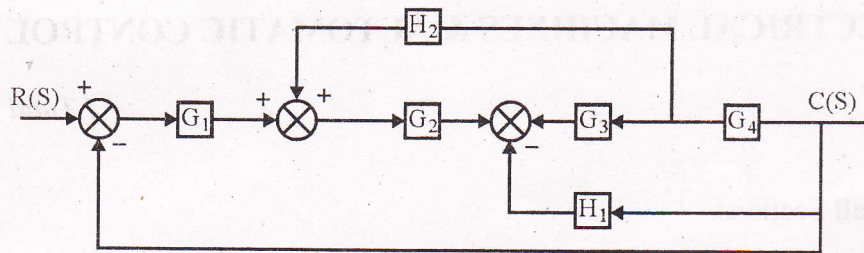


Fig. 1

- (d) A unity feedback system has the forward transfer function $G(S) = \frac{K(2S+1)}{S(5S+1)(1+S)^2}$. The input $r(t) = 1 + 6t$ is applied to the system. Determine the minimum value of K if steady error is to be less than 0.1.
- (e) The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K(S + 9)}{S(S^2+4S+11)}$. Sketch the Root Locus.

Section – C

Answer **all** the questions. Each question carries **10** marks :

3. 1- Φ 10 kVA 2000/200 V, 50 Hz transformer has the following test results :

OC Test (LV Side) : 200 V, 0.8 A, 60 W

SC Test (HV Side) : 40 V, 4 A, 70 W

Calculate the efficiency of the transformer at half load and 0.8 Power factor Lagging .

OR

What are the speed control techniques of DC Motor ?

4. Draw the equivalent circuit of a three phase Induction Motor.

OR

What are the methods of starting of synchronous motors and applications of synchronous motors ?

5. What are the major types of control systems ? Explain them in detail with examples.

OR

Write the differential equations governing the mechanical system shown in Fig. 2. :

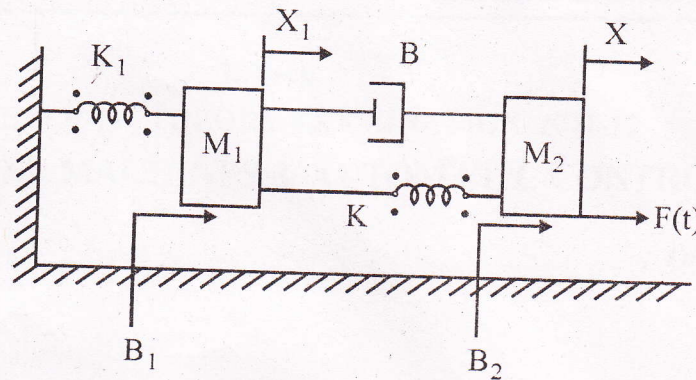


Fig. 2

6. The unity feedback system is characterized by an open loop transfer function $G(s) = K/S(S + 10)$. Determine the gain K so that the system will have a damping ratio of 0.5 for this value of K . Determine settling time, peak overshoot and time for peak overshoot.

OR

Sketch the Bode Plot for the transfer function $G(S) = KS^2/(1 + 0.2S)(1 + 0.02S)$ and determine gain K for Gain Crossover frequency to be 5 rad/sec.

7. Write the representation of P and PI controllers and also their applications.