aktuonline.com

Printed Pages : 4 EEE409

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

PAPER ID : 3988 Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2012-13

ELECTRICAL MACHINES & AUTOMATIC CONTROL

Time : 3 Hours] *[Total Marks : 100*

SECTION – A

1. Attempt **all** question parts. **10 × 2 = 20**

(a) Define efficiency and voltage regulation of a transformer.

(b) State the applications of a servo motor.

(c) Define step angle of a stepper motor. State its significance.

(d) What is a test signal ? Give the different types and their importance.

(e) What are the types of error constants ?

(f) Using Routh-Herwitz criterion, determine the stability of the system represented by the characteristic equation $s^4 + 8s^3 + 16s^2 + 5 = 0$.

(g) Define angle of asymptotes.

(h) What is a PID controller ?

(i) Draw the torque slip characteristics of induction motors.

(j) State the losses of a DC motor.

aktuonline.com

SECTION – B

2. Attempt any **three** question parts. **3 × 10 = 30**

(a) (i) Explain efficiency of a transformer. Why is a transformer not 100% efficient in real-time usage ?

(ii) How do you determine the step angle of a stepper motor ? What are the factors to be taken into account ?

(b) Write the analogous electrical elements in force-voltage analogy for linear mechanical systems.

(c) What is a Transformer ? Give the different types of transformers. State the different losses in a transformer and explain each. How can the losses be minimized ?

(d) Can a series motor be started on no-load condition? Explain with necessary characteristics.

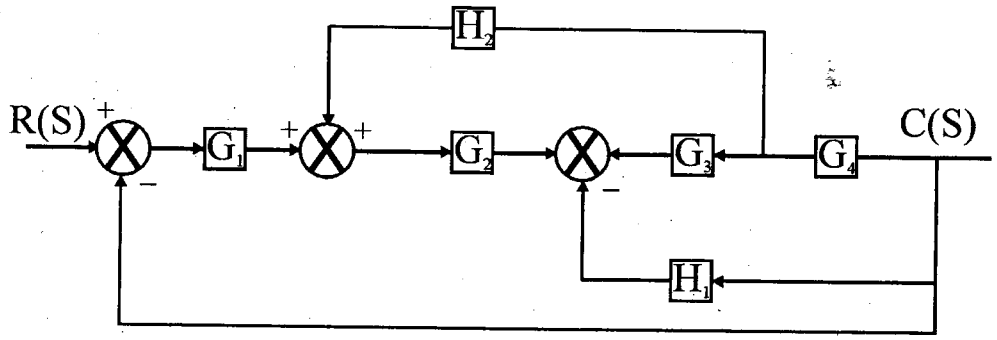
(e) Draw the equivalent circuit of a single phase induction motor.

SECTION – C

Attempt **all** questions. **5 × 10 = 50**

3. Attempt any **two** parts. **2 × 5 = 10**

(a) Determine the transfer function C(S)/R(S) for the system shown below :



aktuonline.com

(b) Explain in detail the open circuit and short circuit test of a single phase transformer.

(c) A unity feedback system has the forward transfer function $G(S) = K(2S + 1) / S(5S + 1)(1 + S)^2$. The input $r(t) = 1 + 6t$ is applied to the system. Determine the minimum value of k if steady state error is to be less than 0.1.

4. Attempt any **one** part. **1 × 10 = 10**

(a) Explain the construction of an induction motor in detail.

(b) The open loop transfer function of a unity feedback system is given by $G(S) = K(S + 9) / S(S^2 + 4S + 11)$. Sketch the root locus.

5. Attempt any **one** part. **1 × 10 = 10**

(a) Single phase 10 kVA 2000 / 200 V, 50 Hz transformer has the following results :

OC test (LV side) : 200 V, 0.8 A, 60 W

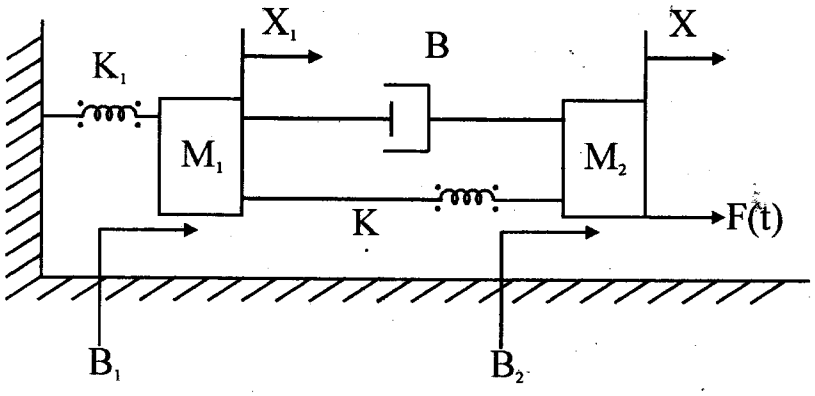
SC test (HV side) : 40 V, 4 A, 70 W

Calculate transformer efficiency at half load and 0.8 pf lagging.

(b) What are the speed control characteristics of an induction motor ?

6. Attempt any **one** part. **1 × 10 = 10**

(a) Write the differential equation governing the following mechanical system :



(b) Write the representation of P and PI controllers and also give their applications.

aktuonline.com

7. Attempt any **two** parts. **2 × 5 = 10**

(a) Sketch the bode plot for the transfer function $G(S) = KS_2/(1 + 0.2S)(1 + 0.02S)$ and determine the gain K for gain crossover frequency to be 5 rad/sec.

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

(c) What are the methods of starting of synchronous motors ? Give their applications.