

## B. TECH.

**THEORY EXAMINATION (SEM-IV) 2016-17**  
**ELECTRICAL MACHINES AND CONTROL**

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

## SECTION - A

1. Attempt all of the following questions:

10 x 2 = 20

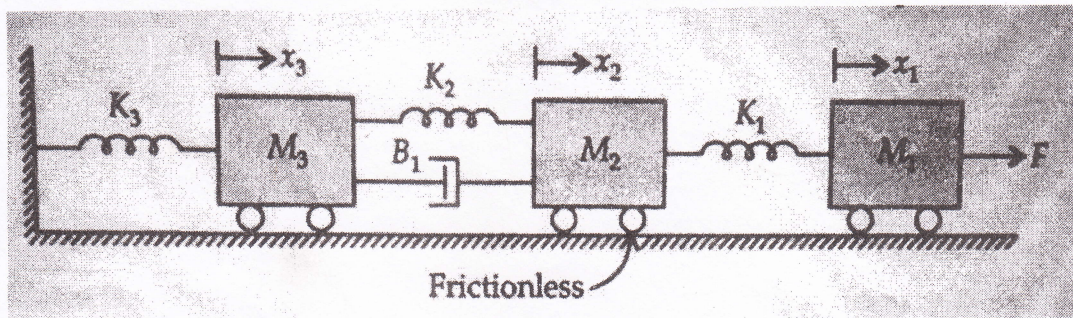
- (a) Define efficiency and voltage regulation of transformer.
- (b) What are different applications of DC motor?
- (c) Draw the torque slip characteristic of 3 -  $\Phi$  induction motor.
- (d) Draw the torque speed characteristic of ac servo motor.
- (e) What are the types of test signals? Give their representation.
- (f) Write the analogous electrical elements in force current analogy for linear mechanical system.
- (g) What are asymptotes? How will you find the angle of asymptotes?
- (h) Define PID controller.
- (i) Using Routh criterion determine the stability of the system represented by characteristic equation:
 
$$2s^4 + 2s^3 + s^2 + 3s + 2 = 0$$
- (j) Write applications of autotransformer

## SECTION - B

2. Attempt any five of the following questions:

5 x 10 = 50

- (a) Explain in detail Open circuit test and Short circuit test of a single phase transformer.
- (b) The open loop transfer function of a unity feedback transfer system is given by  $G(s) = \frac{K}{s(s^2+4s+8)}$  Sketch the root locus.
- (c) Obtain f - v and f - i analogous of the given system in fig.1. Also write the differential equations.



(d) Sketch the polar plot of the following:

$$(i) \quad G(s) = \frac{1}{s(1+s)} \quad (ii) \quad G(s) = \frac{10}{s(s+1)}$$

(e) The open loop transfer function of a unity feedback transfer function is given by:

$$G(s) = \frac{K}{s(1+Ts)}$$

Find by what factor amplifier gain K is to be multiplied so that damping ratio is increased from 0.3 to 0.9

(f) A 200 V dc series motor runs at 500 rpm when taking a current of 25 A. the resistance of armature is 0.5  $\Omega$  and that of field is 0.3 $\Omega$ . If the current remains constant, calculate

the resistance necessary to reduce the speed to 250 rpm.

- (g) What is a Transformer? Give the different types of transformers losses and explain each. How can be they minimized?
- (h) Give constructional details of three phase transformer.
- (i) Explain the working of P, PI, PID controllers.

### SECTION - C

Attempt any two of the following questions:

2 x 15 = 30

3 Explain in detail various methods used for speed control of dc motor.

- 4 (i) Discuss conversion from 3 phase to 2 phase using Scott connection.
- (ii) Sketch the Root Locus for the given unity feedback system:

$$G(s) = \frac{K}{s(s+4)(s+5)}$$

5 What do you understand by Bode plot? What is its importance?  
Draw the Bode plot for the transfer function:

$$G(s) = \frac{16(1+0.5s)}{s^2(1+0.125s)(1+0.1s)}$$

From the graph determine :

- (i) Phase cross over frequency
- (ii) Gain cross over frequency
- (iii) Phase Margin
- (iv) Gain Margin
- (v) System stability