

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

- Define efficiency and voltage regulation of transformer.
- What are different applications of DC motor?
- Draw the torque slip characteristic of 3 – Φ induction motor.
- Draw the torque speed characteristic of ac servo motor.
- What are the types of test signals? Give their representation.
- Write the analogous electrical elements in force current analogy for linear mechanical system.
- What are asymptotes? How will you find the angle of asymptotes?
- Define PID controller.
- Using Routh criterion determine the stability of the system represented by characteristic equation:

$$2s^4 + 2s^3 + s^2 + 3s + 2 = 0$$

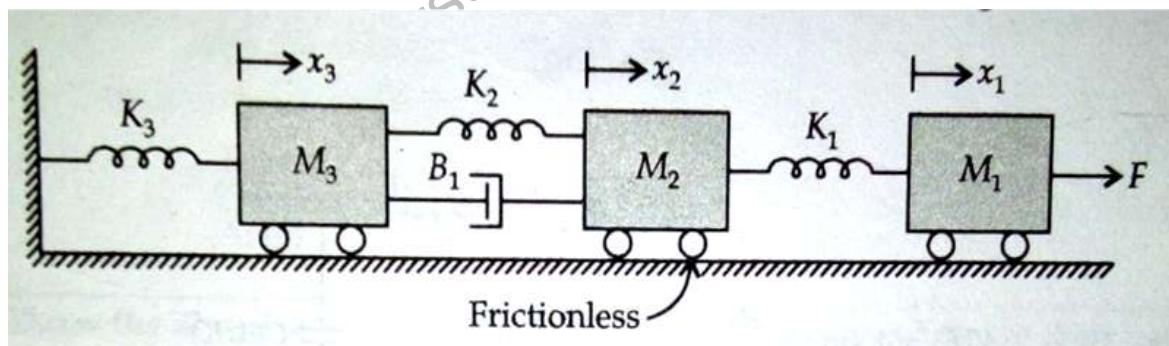
- Write applications of autotransformer

SECTION – B

2. Attempt any five of the following questions:

5 x 10 = 50

- Explain in detail Open circuit test and Short circuit test of a single phase transformer.
- 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.
- Obtain f - v and f - i analogous of the given system in fig.1. Also write the differential equations.



- Sketch the polar plot of the following:

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

- 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

- A 200 V dc series motor runs at 500 rpm when taking a current of 25 A. the resistance of armature is 0.5Ω and that of field is 0.3Ω . 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

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