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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 – Φ 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

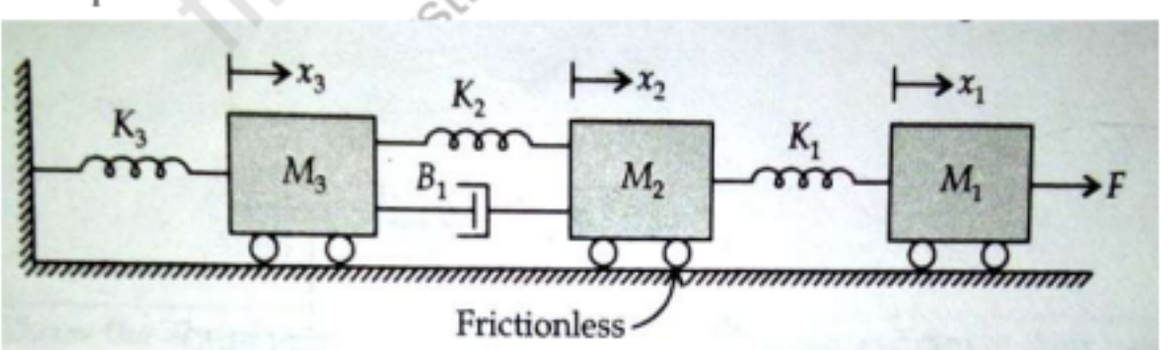
SECTION – B

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

(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 Ω and that of field is 0.3Ω. If the current remains constant, calculate

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the resistance necessary to reduce the speed to 250 rpm.
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(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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