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B. TECH

(SEM IV) THEORY EXAMINATION 2017-18

ELECTRICAL MACHINES AND AUTOMATIC CONTROL

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

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. **2 x10 = 20**

a. Why is the SC test performed at reduced voltage on the HV side?
b. Explain the basic purpose of a tertiary winding. To what additional use can it be put?
c. What is the use of commutator in dc machine.
d. Draw the torque slip characteristic of three phase induction motor.
e. Draw and explain the V-Curve of Synchronous motor.
f. What are the advantages of closed loop control system?
g. What do you mean by periodic signal?
h. Explain the concept of stability of a system.
i. Using Routh criterion determines the stability of the system represented by characteristic equation.

$$2S^4+5S^3+5S^2+2S+1 = 0$$

j. What are the applications of PID controller.

SECTION B

2. Attempt any three of the following: **10 x 3 = 30**

a.) Explainthe efficiency of single phase transformer and drive the relation for maximum efficiency.

b.) Explain the construction and working of two phase servomotor. Also give its applications.

c.) Give the force voltage and force current analogy of electric circuit and mechanical system.

d.) Derive the relations for the time response of a second order system with unit step input.

e.) Draw the root locus for the given unity feedback system.

$$\frac{K}{s(s^2+4s+13)}$$

SECTION C

3. Attempt any one part of the following: **10x 1 = 10**

(a) Discuss Scott connection for the three phase to two phase conversion in transformer.

(b) In a 110 V compound generator, the resistanceof the armature, shunt and series windings are0.06, 25 and 0.05 W respectively, The loadconsists of 200 lamps each rated at 55 W,100 V. Find the emf and armature current,when the machine is connected for (a) longshunt (b) short shunt.Ignore armaturereaction and brush voltage drop.

4. Attempt any one part of the following: **10 x 1 = 10**

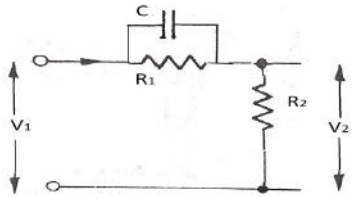
(a) What methods are used in starting squirrelcageinduction motor? Which method is usedin what size of motor? Which is the mostcommon method and what is its superiority?

(b) Why three phase synchronous motor is not self-starting? Explain any two methods of starting of synchronous motor.

5. Attempt any one part of the following: 10 x 1 = 10

(a) Give the mathematical representation of unit step, unit ramp and unit impulse signal.

(b) What do you mean by transfer function, Derive the relation for closed loop transfer function., find the transfer function of the circuit given in figure



6. Attempt any one part of the following: 10 x 1 = 10

(a) Explain bounded input bounded output stability criterion. The characteristic equation of feedback control system is

$$S^4+20S^3+15S^2+2S+K = 0$$

Determine the range of K for the system to be stable.

(b) What do you mean by the Nyquist criterion for stability and determine the stability of a given open loop transfer function using Nyquist criterion.

$$\frac{K}{s^2(1+sT)}$$

7. Attempt any one part of the following: 10 x 1 =10

(a) Explain the response of P, PI and PID controller and its characteristics.

(b) Draw the bode plot for the transfer function

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

Determine Gain margin, phase margin and check for stability.