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

Paper ID : 121413 Roll No. | | | | | | | | | |

B. TECH

Theory Examination (Semester-IV) 2015-16

ELECTRIC MACHINE & AUTOMATIC CONTROL

Time : 3 Hours *Max. Marks : 100*

Section-A

1. Attempt ALL questions. All parts carry equal marks (2×10=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) Define step angle of a stepper motor. State its significance.

(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?

(a) Explain in detail Open circuit test and Short circuit test of a single phase transformer.

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

(c) The open loop transfer function of a unity feedback transfer system is given by $G(s)=\frac{K(s+9)}{s(s^2+4s+11)}$

Sketch the root locus.

(d) Obtain f - v and f - i analogous of the given system in fig.1. Also write the differential equations.

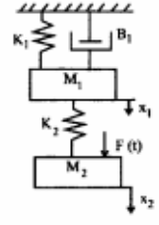

Fig. 1

transfer function is given by:

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

(i) Find by what factor gain K is to be reduced so that overshoot is reduced from 60% to 15%.

(ii) Find by what factor gain K is to be reduced so that damping ratio is increased from 0.1 to 0.6

(g) A DC series motor runs at 1000 rpm, on 220 V supply drawing a current of 20 A. The total resistance of the machine is 0.15 Ω. Calculate the value of extra resistance to be connected in series with motor circuit that will reduce the speed to 300 rpm. The torque then being half of the previous value. Assume flux proportional to current.

(h) What is a Transformer? Explain different types of transformers and different losses in a transformer. How can the losses be minimized?

Section-C

Note : Attempt any TWO of the following. **(15×2=30)**

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

4. 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

5. (i) Discuss conversion from 3 phase to 2 phase using Scott connection.

   (ii) Sketch the Root Locus for the given unity feedback system:

$$G(s)=\frac{K}{s(s+2)(s+1)}$$