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

PAPER ID : 3988 Roll No. | | | | | | | | | | |

B.Tech.

(SEM IV) EVEN SEMESTER THEORY EXAMINATION, 2009-2010

ELECTRICAL MACHINES & AUTOMATIC CONTROL

Time : 3 Hours *Total Marks : 100*

Note : *Attempt ALL the questions.*

1. Attempt **any two** parts :

   (a) A 440 V series motor has a load resistance of 0.8 ohm. It takes 110 A to give the rated output at 800 rpm. Determine the resistance of the resistor to be added to obtain rated torque :

   (i) At starting

   (ii) At 600 rpm

   Assume flux is proportional to current.

   (b) Explain with suitable circuit and phasor diagram Open circuit test and short circuit test of transformer.

   (c) Deduce the expression for auto-transformer saving of copper compared to two winding transformer.

(c) Compare the open loop control system and closed loop control system.

(d) Develop the block diagram of armature controlled D.C. Motor and justify that back emf contributes additional damping.

(e) Develop differential equation model for mechanical system shown in figure - 2

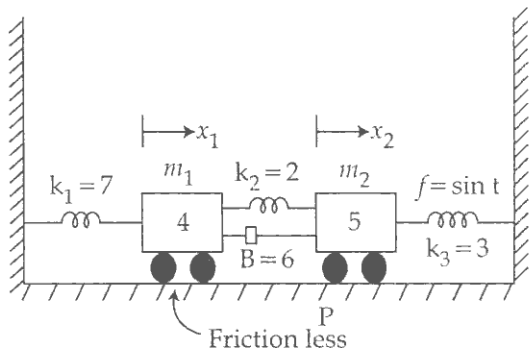

Figure - 2

4. Attempt **any two** parts :

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

$$G(S)\,H(S) = \frac{K}{(S+1)(1+2S)(1+3S)\,S}$$

Determine the value of K

(i) For which the system is stable.

(ii) Which will cause sustained oscillations in the closed loop system ?

(b) Draw the polar plot for the following transfer function :

$$G(S) = \frac{1}{S(aS + 1)}$$

(c) Write the Routh Stability Criterion and its limitation taking suitable example.

5. Attempt **any two** parts :

(a) Sketch the root locus for the following system :

$$G(S)\,H(S) = \frac{K}{(S + 2)(S + 4)(S + 8)\,S}$$

Determine the location of dominant characteristic roots for damping ratio of 0.707.

(b) Sketch Bode Plot for a feedback system with loop transmittance :

$$G(S)\,H(S) = \frac{100(S + 4)}{S(S + 0.5)(S + 10)}$$

And find :

(i) Gain Margin

(ii) Phase Margin

(iii) Gain cross over frequency

(iv) Phase cross over frequency. Comment on closed loop stability.

(c) Deduce the expression for the P and PID controllers also compare their advantages and disadvantages.

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