BTS(C) – VI – 09 – 006 – T

B. Tech Degree VI Semester Examination, April 2009

ME 601 INSTRUMENTATION AND CONTROL SYSTEMS

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer ***ALL*** questions)

(8 x 5 = 40)

I. (a) What are the functional elements of an instrumentation system. Briefly explain.

(b) What is static calibration? Explain.

(c) What is a strain gauge rosette? How do you determine the stresses and strains when using a two element rosette?

(d) With the help of a diagram explain a typical thermocouple circuit set up.

(e) Define static error constants.

(f) Explain the time domain specifications of a second order system to a unit step input.

(g) The open loop transfer function of a unity gain feedback system is $\frac{K}{s(1+0.4s)(1+0.25s)}$

Find the range of K, for the system to be stable.

(h) Write a short note on tachogenerator.

PART B

(4 x 15 = 60)

II. (a) Explain the generalized mathematical model for a first order system with a suitable example. (10)

(b) Differentiate between reproducibility and repeatability. (5)

OR

III. (a) Discuss in detail the different types of errors in measurement. (9)

(b) How these errors can be avoided/corrected? Explain. (6)

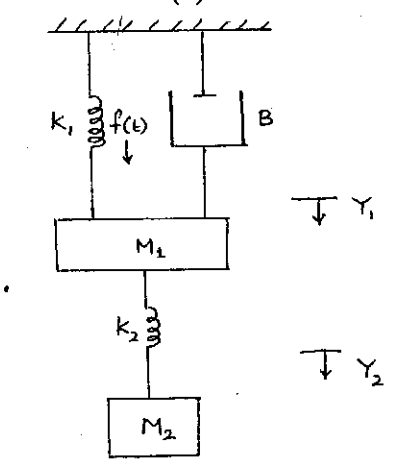
IV. (a) Define gauge factor. Derive an expression for the gauge factor of a resistance strain gauge. (10)

(b) What are the different types of strain gauges? Explain. (5)

OR

V. State and explain in detail the laws of thermocouples with their applications. (15)

VI. (a) Determine the transfer function $\frac{Y_2(s)}{F(s)}$ of the given mechanical system. (8)



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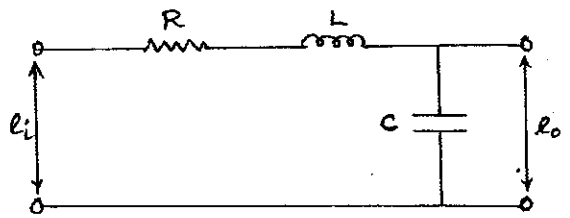
(b) Explain PID Controller with its transfer function. (7)

OR

VII. (a) Give the state space representation of the given electrical system. (5)



(b) Find the transfer function of a thermal system. (10)

VIII. For the following transfer function, draw a bode plot and obtain gain – cross over frequency.

$$G(s)=\frac{20}{s(1+3s)(1+4s)}.$$ (15)

OR

IX. Sketch the root locus of the system, whose open loop transfer function is

$$G(s)=\frac{K}{s(s+2)(s+4)}.$$

Find the value of K so that the damping ratio of the closed loop system is 0.5. (15)

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