



Printed Pages : 7

TEC-504

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

PAPER ID : 3088

Roll No.

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B. Tech.

(SEM. V) EXAMINATION, 2008-09 AUTOMATIC CONTROL SYSTEM

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Answer all questions. All questions carry equal marks.
 - (2) Choices are internal to each question.
 - (3) Answers must be to the point.
 - (4) Assume practicable data in case any are missing.
 - (5) May assume names of missing variables and constants, if necessary.
 - (6) Throughout this paper, ω_n represents angular frequency of natural resonance, ζ is damping factor.

1 Answer any **four** parts :

- (a) Reduce the block diagram shown in **Fig. 1(a)** 5 using block diagram algebra and obtain the system transfer function C/R :



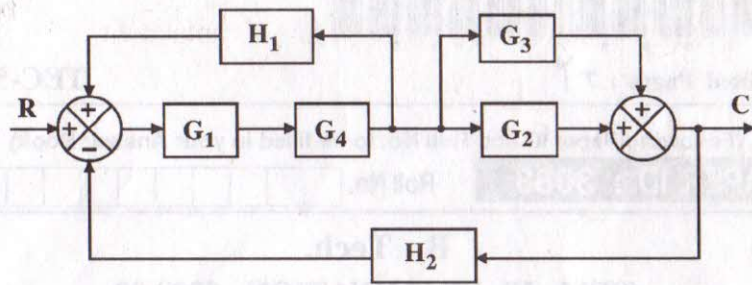


Fig. 1 (a)

- (b) In Fig. 1 (b) M_1, M_2 are mass, k_1, k_2 are spring constant, f_1, f_2 are coefficient of solid friction, x_1, x_2 are displacement and F is force. Is the system linear? Justify your answer. Assume that static and dynamic friction coefficients are equal :

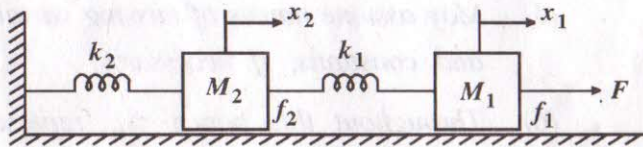


Fig. 1 (b)

- (c) If now in Fig. 1(b), f_1, f_2 are viscous drag constants instead of coefficient of solid friction, comment upon the linearity of the system. With F as input and x_1 as output, what will be the order of the system and why?

5 Answer any two parts :

- (a) For the system described in question no. 1(c) choose suitable state variables and form the state equations. Is your state transition matrix in any canonical form? 10
- (b) Define the exponential of a matrix. Explain why Jordan canonical form matrices are important for easy solution of state equations. 10
- (c) Write a note on (any one) : Fuzzy Control 10

OR

Application of Neural Networks in Control Engineering.

