

Student Exam No: _____

GANPAT UNIVERSITY
B.TECH SEM. IV BIOMEDICAL & INSTRUMENTATION ENGINEERING
REGULAR EXAMINATION MAY/JUNE-2012
2BM402: CONTROL SYSTEM ENGINEERING

TIME: 03 HOURS

TOTAL MARKS-70

- INSTRUCTIONS: - 1 All the questions are compulsory.
2 Figure to the right indicates full marks.
3 Answer to each section must be written in separate answer sheet.
4 Assume suitable data if necessary.

SECTION-I

Que.-1

12

- (a) What is closed loop control system? Draw generalized block diagram of closed loop control system and explain all the related terms with merits & demerits.
(b) Enlist the characteristics of Transfer Function. Derive the TF of field controlled DC servo motor.

OR

Que.-1

12

- (a) What is servo mechanism? With diagram explain the servo mechanism with example & application.
(b) Give the purpose and definition of analogous system. Enlist the types of analogous system and explain them with advantages.

Que.-2

11

- (a) Derive the TF of the system shown in fig.1
(b) Using Mason's gain formula derive the overall gain of the signal flow graph shown in fig.2

OR

Que.-2

11

- (a) For given block diagram in fig.3 derive the TF using block diagram reduction technique
(b) For the system shown in fig.4 obtain the Force-Voltage analogy system.

Que.-3

12

- (a) For given $GH(s) = \frac{12}{s(s+1)(s+2)}$ draw the polar plot and determine stability of system.
(b) Define the translational mechanical system. Explain the idealized components used for the analysis of translational mechanical system.

SECTION-II

Que.4

12

- (a) What is the requirement of standard test signals? Explain the different types of standard test signals used to analyze the time response of a control system.
- (b) Draw and explain the time response of the first order system to the unit step input.
- (c) Draw and explain the various time response specifications of second order system?

OR

Que.4

12

- (a) Draw and explain the time response of second order system subjected to unit step input for $\xi < 1$, $\xi = 1$ and $\xi > 1$, where ξ is damping ratio.
- (b) Derive the expression for steady state error for various types of standard test signals.

Que.5

11

- (a) Sketch the root locus of a unity feedback control system with,

$$G(s) = \frac{K}{s(s+3)(s+6)}$$

- (b) By means of the Routh's criterion, determine the stability of the system represented by $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$.

OR

Que.5

11

- (a) Sketch the root locus of a unity feedback control system with,

$$G(s) = \frac{K}{(s+2)^3}$$

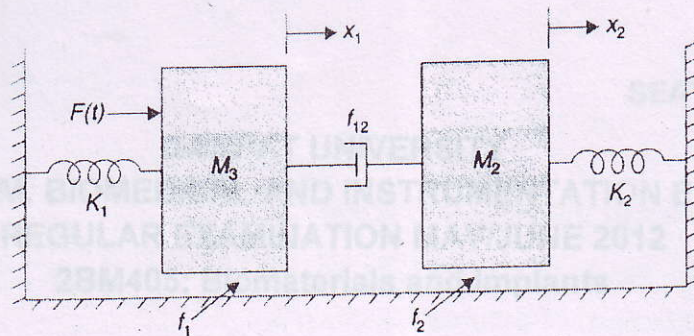
- (b) What is Routh's criterion? Enlist and explain the application, advantages and disadvantages of Routh's criterion.

Que.6

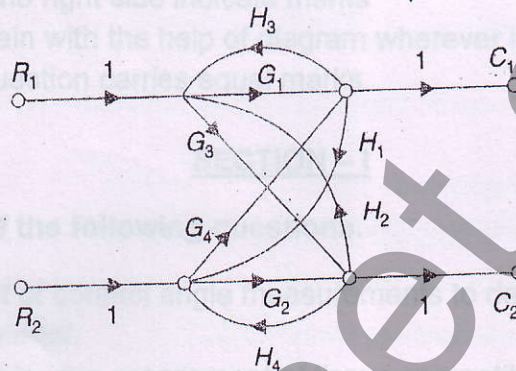
12

- (a) Draw and explain the general block diagram of an automatic closed loop control system with the help of example.
- (b) Explain with a neat diagram the constructional features and working of a synchros as an error detector.

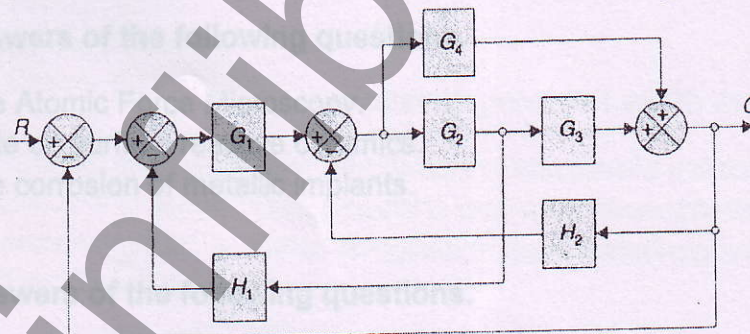
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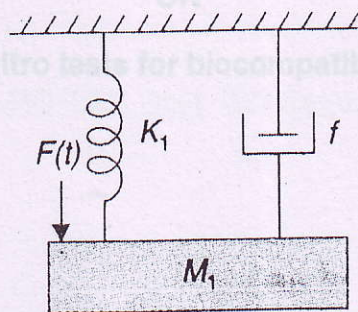
Q-2 (a) Fig.1



Q-2 (b) Fig.2



OR Q-2 (a) Fig.3



OR Q-2 (b) Fig.4