

GANPAT UNIVERSITY
B.TECH SEM. VI - MECHANICAL ENGINEERING
CBCS REGULAR EXAMINATION MAY/JUNE - 2013
2ME-601 CONTROL SYSTEM ENGINEERING

Time: 3 Hours

Total Marks: 70

Instructions:

- 1). All questions are **compulsory**.
- 2). Figures to the **right** indicate full marks.
- 3). Answers to the two sections must be written in **separate answer books**.
- 4). Assume all necessary data.

Section – I

Que:-1 Attempt All.

- (A) What is the function of FRL unit in pneumatic system? Explain Lubricator with diagram.
- (B) Explain detailed classification of control systems.
- (C) What are the requirements of a good control system?

[12]

OR

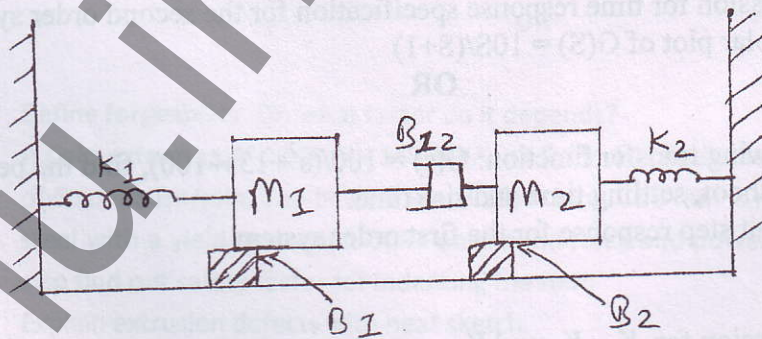
Que:-1 Attempt All.

- (A) What is a closed loop control system? Draw its general block diagram and explain aircraft landing system.
- (B) Define transfer function. Prove that for an impulse input to a system, the response of the system is transfer function of the system itself.
- (C) Which method is used to solve SFG? Derive it with steps.

[12]

Que:-2 (A) Draw FBD and Nodal diagram for the system shown below. Find out the transfer function and also derive Force-Voltage analogy for the same.

[07]



(B) Explain servomechanism with brief.

[04]

OR

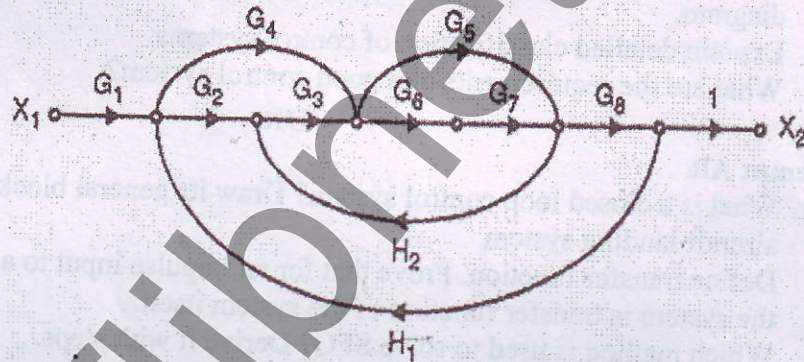
- Que:-2 (A) Explain about hydraulic power steering mechanism. Derive the mathematical model for the same. [07]
 (B) Describe all the basic components of hydraulic system. [04]
- Que:-3 **Attempt All.** [12]
 (A) Explain any four rules of block diagram reduction.
 (B) Write down properties, advantages and disadvantages of transfer function.
 (C) What is analogous system? Derive equations for Force-Current analogy.

Section – II

- Que:-4 **Attempt All.** [12]
 (A) Explain different types of standard test signals.
 (B) Define the following terms: Path, Node, Loop and Non touching loop.
 (C) Write down the steps for constructing root locus.

OR

- Que:-4 **Attempt All.** [12]
 (A) Using Mason's formula determines X_2/X_1 .



- (B) Derive the equation of steady state error for first order system.
 (C) Determine the stability of the transfer function
 $s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$

- Que:-5 (A) Derive expression for time response specification for the second order system. [06]
 (B) Sketch the polar plot of $G(S) = 10S/(S+1)$ [05]

OR

- Que:-5 (A) For the following transfer function: $G(s) = 100/(s^2 + 15s + 100)$, find the peak time, percent overshoot, settling time and rise time. [06]
 (B) Derive the unit step response for the first order system [05]

- Que:-6 **Attempt All.** [12]
 (A) Derive expression for K_a , K_p and K_d .
 (B) Do comparison between signal Flow Graph and Block Diagram
 (C) Write down the steps for constructing bode plot.

END OF PAPER