Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VI Mechanical Engineering

Regular Examination May – June 2014

2ME601 CONTROL SYSTEM ENGINEERING

Time: 3 Hours   **Total Marks: 70**

Instruction:
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.**		12
	A	Write short note on Servomechanism.	4
	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.	4
	C	Define Poles & Zeros of Transfer function. Show in diagram with appropriate example.	4

OR

Que. – 1	**Attempt all.**		12
	A	Define closed loop control system. Draw its general block diagram and explain cruise control system.	4
	B	Explain the properties of transfer function with advantages and disadvantages.	4
	C	Draw and explain the block diagram of PLC.	4
Que. – 2	**Attempt all.**		11
	A	Explain about hydraulic power steering mechanism. Derive the mathematical model for the same.	6
	B	Explain air energy production and consumption system in pneumatics with suitable line diagram.	5

OR

Que. – 2	**Attempt all.**		11
	A	What is analogous system? Derive equations for Force-Voltage analogy and Force-Current analogy.	6
	B	Using Mason's Gain formula, solve the following SFG.	5
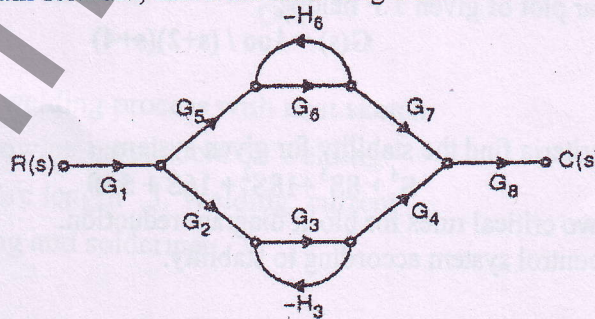
Que. – 3	**Attempt all.**		12
	A	Explain the feed forward control system with diagram and example.	4
	B	Write a short note on RTD with necessary diagrams.	4
	C	Explain detailed classification of control systems.	4

Que. – 4 **Attempt all.** 12
- A Describe the two special cases of routh's stability criterion with example. 4
- B Explain the time response of a second order system subjected to unit impulse input for over damped and under damped system. 4
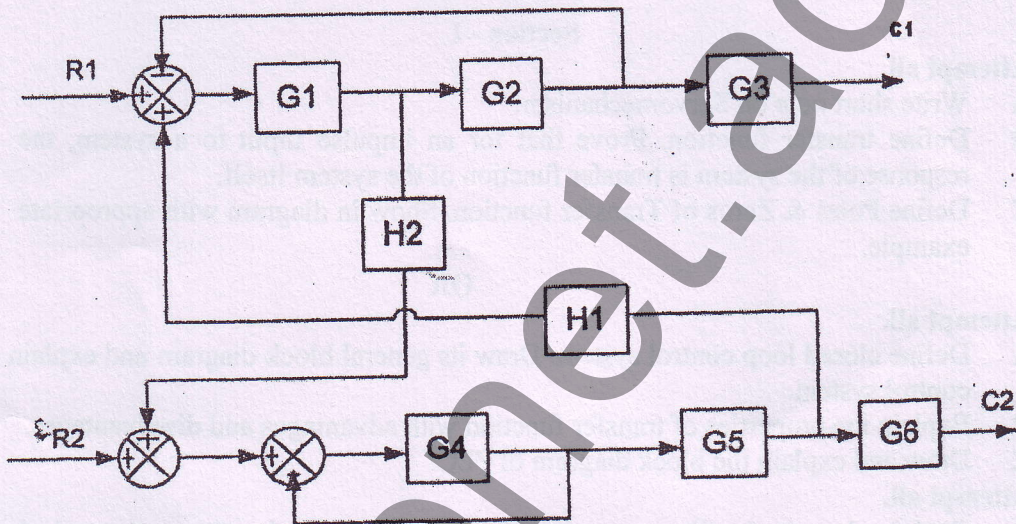- C Determine the equations for various static error coefficients. 4

OR

Que. – 4 **Attempt all.** 12
- A The response of a control system after applying unit step input is 4

$$c(t) = 1 + e^{-40t} - 2 . e^{-20t}$$

  Find time domain specifications.
- B Derive the equation for unit step response of a first order system. 4
- C Find the transfer function of following block diagram: 4

Que. – 5 **Attempt all.** 11
- A Describe the steps to construct a bode plot. 6
- B Draw a polar plot of given T.F below: 5

$$G(s) = 200 / (s+4)$$

OR

Que. – 5 **Attempt all.** 11
- A Describe the various time domain specifications with diagram and equations. 6
- B Draw the polar plot of given T.F below: 5

$$G(s) = 1oo / (s+2)(s+4)$$

Que. – 6 **Attempt all.** 12
- A By Hurwitz criteria find the stability for given system 4

$$S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$$

- B Discuss the two critical rules for block diagram reduction. 4
- C Classify the control system according to stability. 4

END OF PAPER