Evening

Date :- 28/11/2014.

Student Exam No: _____

GANPAT UNIVERSITY

B.TECH SEM. V - MECHATRONICS ENGINEERING

CBCS REGULAR EXAMINATION NOV/DEC - 2014

2MC-504 CONTROL 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.** **[12]**

(A) Prove that for a system with impulse input, the response equals the T.F. Write down the properties of T.F.

(B) Define closed loop control system. Explain the missile launching system.

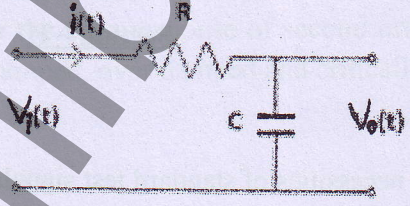
(C) Explain working of Synchronous motor.

OR

Que:-1 **Attempt All.** **[12]**

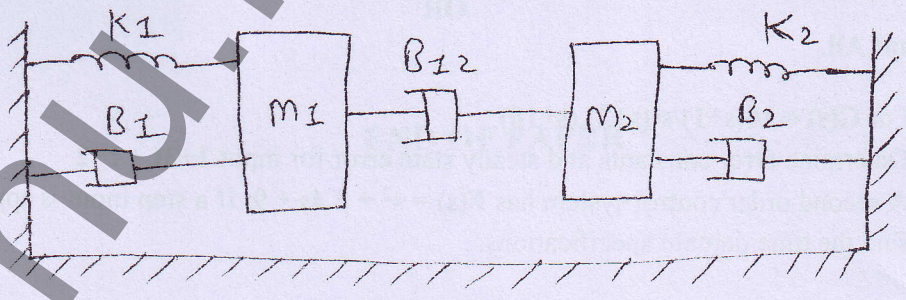
(A) Derive equations for basic elements of translational motion of mechanical systems.

(B) What is Transfer Function? Find out the TF for following circuit.



(C) Explain the Angular position control Servomechanism in detail.

Que:-2 (A) Draw free body diagram for the system shown below. Find out the transfer function and also derive Force-Voltage analogy for the same. **[06]**



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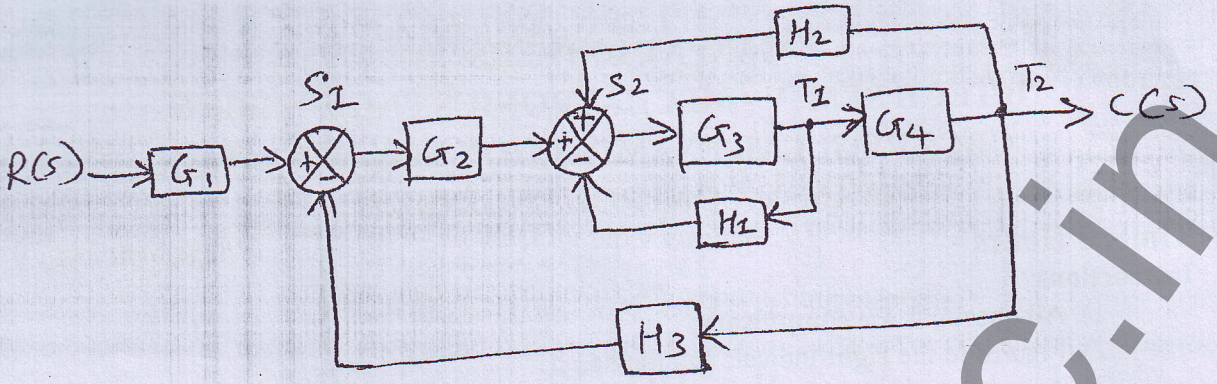
(B) Find T.F using Mason's Gain Formula for following system: [05]



OR

Que:-2 (A) Draw the Nyquist plot for the following system. Is the system stable? [06]

$G(s)=1/s(s-1)$

(B) Write down properties of SFG. Write down Mason's gain formula and steps to solve signal flow graph. [05]

Que:-3 **Attempt All.** [12]

(A) Explain detailed classification of control systems.

(B) Discuss working of stepper motor.

(C) Explain the Poles & Zeros of Transfer function with an appropriate example.

Section – II

Que:-4 **Attempt All.** [12]

(A) What are the necessities of standard test signals? Explain the various standard test signals.

(B) Discuss the various types of control system based on stability

(C) Derive the expression for first order system. Derive the equation for unit ramp response of a first order system.

OR

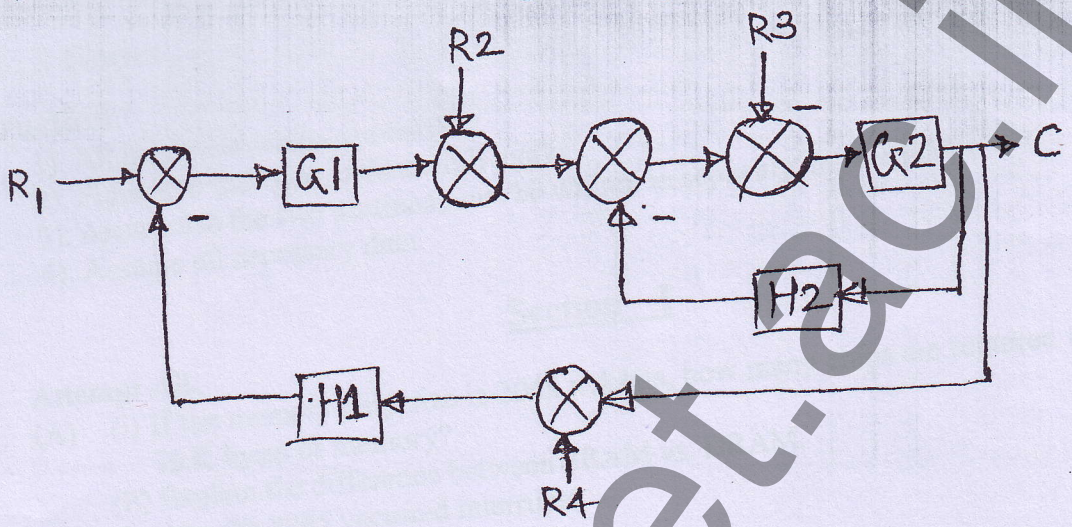
Que:-4 **Attempt All.** [12]

(A) For $G(s) = 10(s+1)/s^2(s+2)(s+10)$
Determine error constants and steady state error for input $1+3t + t^2/2$.

(B) A second order control system has $F(s) = s^2 + 2.4s + 9$. If a step input is applied to it, find the time domain specifications.

(C) Define terms: 1) Damping ratio,
2)Natural frequency,
3)Sensitivity,
4)Bandwidth

Que:-5 **(A)** Find the transfer function for following block diagram. **[06]**



(B) Sketch the polar plot of **[05]**

$$G(S)= 100/(S+3)$$

OR

Que:-5 **(A)** Explain the steps for drawing Bode plot. **[06]**

(B) Derive the expression for the time response of second order system subjected to unit impulse input for under damped, over damped and critically damped system. **[05]**

Que:-6 **Attempt All.** **[12]**

(A) Determine the stability of the given characteristic equation.

$S^6 +2S^5+8S^4+12S^3+20S^2+16S+16=0$

(B) Explain the time domain indices with figure.

(C) Discuss the two critical rules of block diagram reduction.

END OF PAPER