Code No: 09A50204 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year I Semester Examinations, November/December-2013
CONTROL SYSTEMS
(Common to EEE, ECE, ETM)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks

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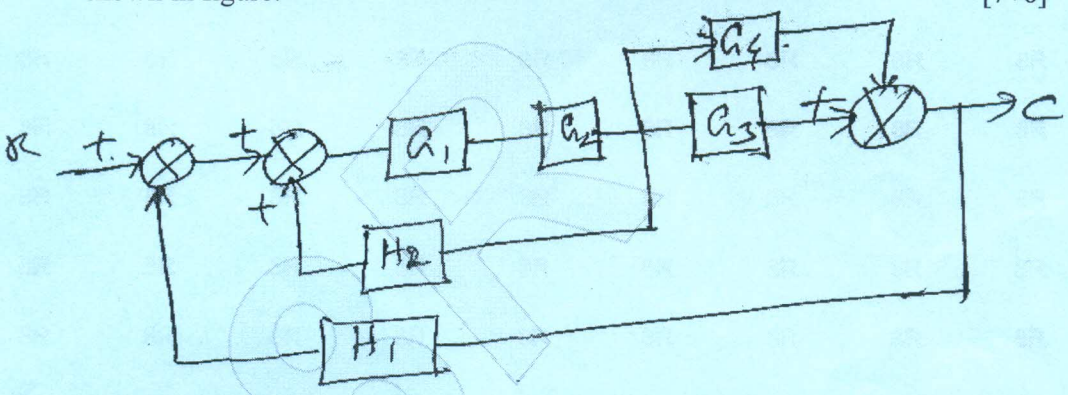
1.a) What are the merits and de-merits of open-loop and closed-loop systems.
b) Explain the characteristics of feed-back and effects of feed-back. [7+8]

2.a) Explain Mason's Gain Formula.
b) Using signal flow graph method determine the gain C/R for the block diagram shown in figure. [7+8]



3.a) Derive expressions for rise time, peak time end peak over short.
b) Obtain the unit-step response of a unity feed back system whose open-loop transfer function is $G(s) = \frac{4}{s(s+s)}$. [7+8]

4. A unity feed back control system has an open-loop transfer-function $G(s) = \frac{K}{s(s^2+4s+13)}$. Sketch the root locus. [15]

5.a) Define Phase margin and gain margin.
b) The specifications given on a certain second order feed back control system is that the over shoot of the step response should not exceed 25%.
i) What are the corresponding limiting values of the damping ratio and the peak resonance Mr?
ii) Determine the corresponding values for ω_r and t_p when $\omega_n = 10 rad/\sec$.
[15]

6.a) Sketch the Bode plot for the system having $G(s)H(s)=\frac{20}{s(1+0.1s)}$ and obtain phase margin and gain margin.

b) Write short note on polar plots. [7+8]

7. Open loop transfer function of an unity feedback system is $G(s)=\frac{500}{s(0.1s+1)}$. Design a suitable compensator so that the system acquires a damping factor of 0.4 with out loss of steady state stability. [15]

8. Write short notes on:
a) Concepts of state and state variables
b) Obtain state model for the following differential equation $\ddot{y}+2\dot{y}+6y+7y=u$. [7+8]

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