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FACULTY OF ENGINEERING AND TECHNOLOGY

B.E(Mechanical) Year Examination - May– 2015

Automatic Control System

(Revised)

[Time: Three *Hours*] **[Max. Marks: 80]**

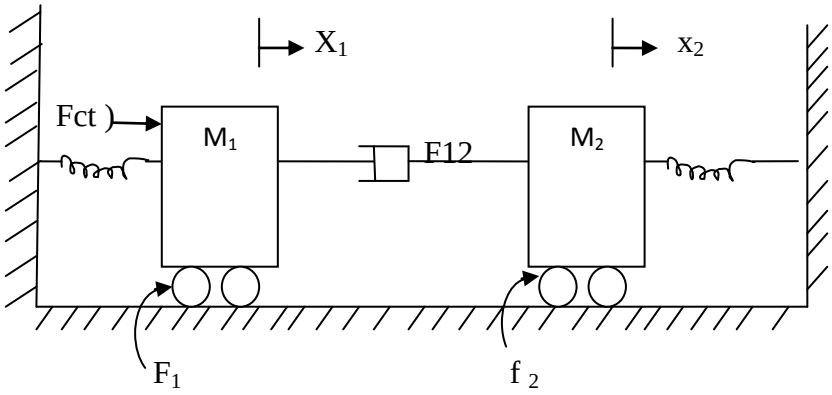
"Please check whether you have got the right question paper."

i) Attempt any three questions from each section.
ii) Use of semi log and graph paper allowed.
iii) Make necessary assumptions and state them clearly
iv) Figures to the right indicate full marks.

SECTION - A

Q.1 a) Differentiate open loop and closed loop control system with an example? 07

b) Write the differential equations for the mechanical system shown in fig. 07

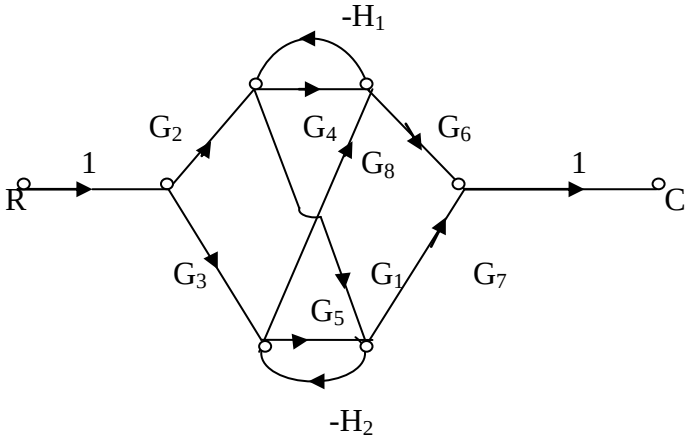


Q.2 a) Explain in detail fluid system? 06

b) Explain in detail the servomechanism system. 07

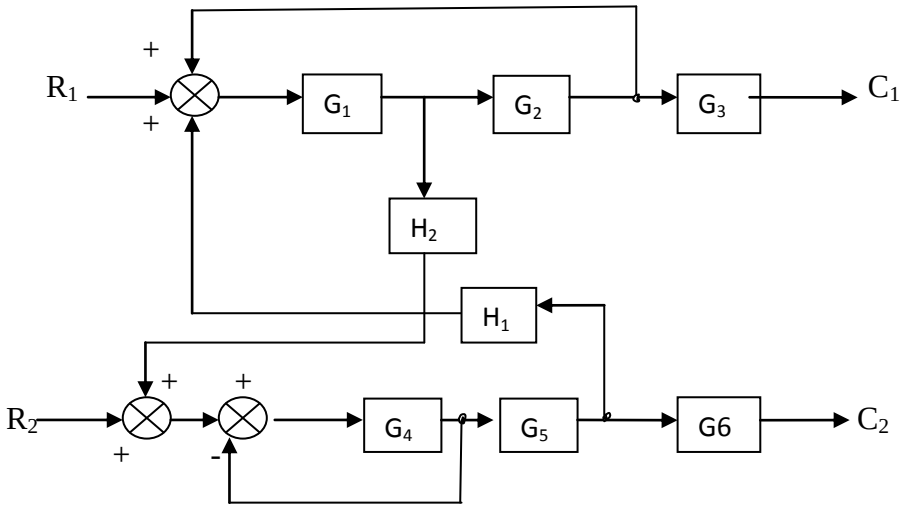
Q.3 a) Which are the different block reduction rules? Explain in detail. 06

b) Obtain the overall transfer function C/R from signal flow graph shown in fig. 07



Q.4 a) Explain in detail the derivative and integral type control system. 06

b) From the block diagram shown in fig determine C_1/R_1. 07



Q.5 a) Explain in detail position control system. 06
b) Explain in detail PID control system. 07

SECTION - B

Q.6 a) Draw the time response of second order system and define the time response const. for under damped system. 06
b) Find delay time, rise time, peak time settling time, max overshoot for unity feedback system $G(s) = \frac{16}{s(s+8)}$. 07

Q.7 a) For a system $G(s).H(s) = \frac{k}{s^2(s+2)(s+3)}$ find K to limit the error for input $1 + 10t + \frac{40}{2}t^2 to\ 10$. 07

b) A unity feedback system characterised by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$. Determine the gain K. so that the system will have a damping ratio of 0.5. for this value of K determine settling time, peak overshoot, and time to peak overshoot for unit –step input. 06

Q.8 a) Find the range of K for stable operation $s^4 + 6s^3 + 11\,s^2 + 6s + k = 0$ 06
b) Write in detail Nyquist stability criterion. 07

Q.9 Construct the bode plot for a unity feedback control system having $G(s) = \frac{4}{s(1+0.5s)(1+0.08s)}$ 14
From the diagram find wgc, wpc, gm, pm and comment on stability.

Q.10 a) Draw the root locus for the open-loop transfer function 07
$$G(s) = \frac{K}{(s+2)(s+3)(s+7)}$$
b) Explain in detail the method for sketching the root locus 06