5E5043

Roll No. _____ Total No of Pages: 4

5E5043

B. Tech V Sem. (Main) Exam. Nov-Dec. 2015
Electrical Engineering
5EE3A Control Systems
Common with EX (Electrical & Electronics Engg.)

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Main: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

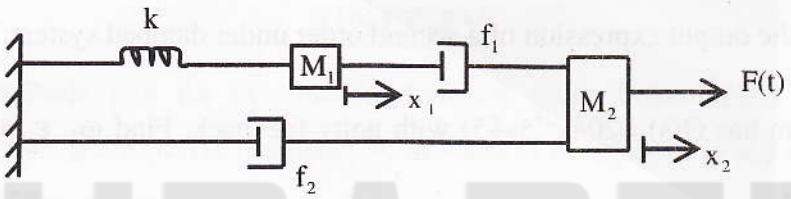
Use of following supporting material is permitted during examination.

1. Simple Graph paper _____ 2. Semi-log Graph paper _____

UNIT-I

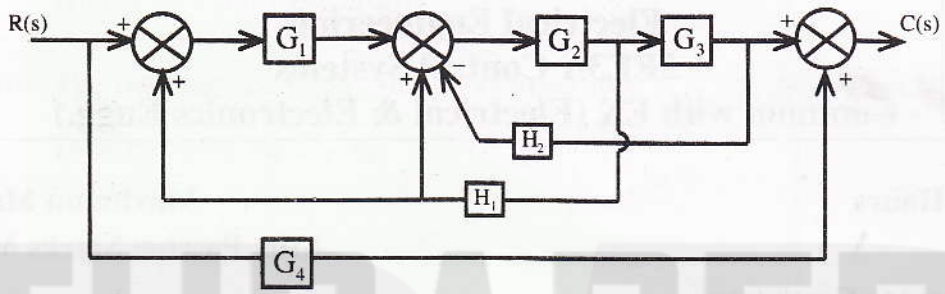
Q.1 (a) Differentiate between open loop and closed loop system with examples. [4]

(b) Determine system equations of the system shown in fig below. Also draw F-V analogy. [12]

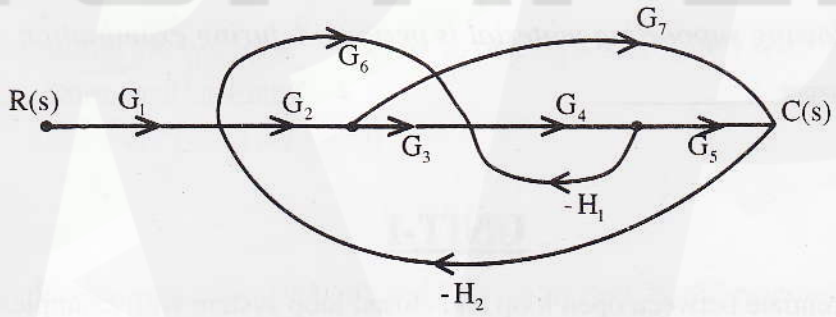


OR

Q.1 (a) Obtain the transfer function of the block diagram shown below. [10]



(b) Obtain the overall gain of the SFG shown using Mason's gain formula. [6]



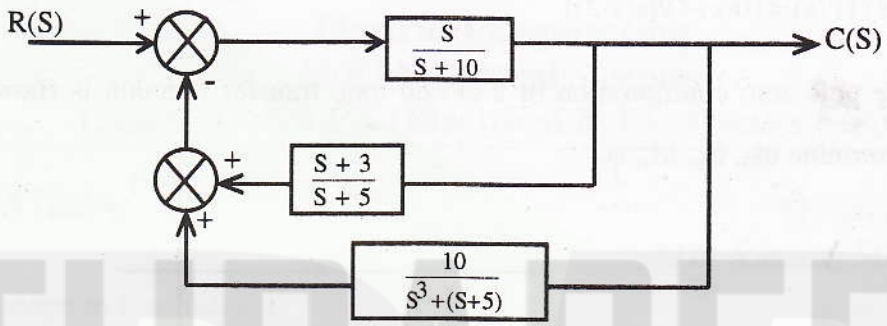
UNIT-II

Q.2 (a) Derive the output expression of a second order under damped system. [10]

(b) A system has $G(s) = 20/(s^{2+}5s+5)$ with unity feedback. Find ω_n, ε_v, ω_d, t_d, t_r, t_p, M_p and t_s. [6]

OR

Q.2 (a) Find error coefficients of the given system. [10]



(b) Explain the effect of ε_v on pole location. [6]

UNIT-III

Q.3 (a) Determine using Routh's stability criteria the range of K for stability and the frequency of oscillation when system is marginally stable for unity feedback system having.

$G(s)=K/[(s+1)^3(s+3)]$ [10]

(b) Explain construction and working of AC servo motor. [6]

OR

Q.3 (a) Sketch the root locus for: $1+G(s)H(s)=1+K(s+2)/[s^2+2s+2]$ [12]

(b) Explain the effect of adding poles and zeros on the root locus. [4]

UNIT-IV

Q.4 Draw the Bode plot for the transfer function given below. Find gain crossover frequency, phase crossover frequency, GM and PM of the system and comment on the stability of the system. [16]

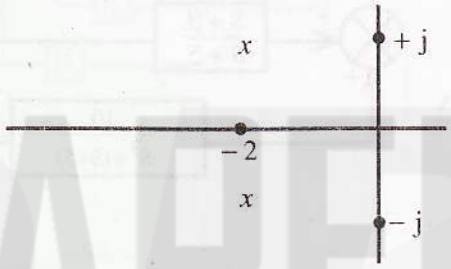
$G(s)\,H(s)=3(s+1)(s+700)/[s^2(s^2+18s+400)]$

OR

Q.4 (a) Draw the Nyquist plot for a system having -

$G(s)\,H(s) = 10(s+4)/[s(s-2)]$ [10]

(b) The pole zero configuration of a closed loop transfer function is shown below. Determine ω_b, ω_r, M_r, φ_r. [6]



UNIT-V

Q.5 Compensate the system given below so that $K_v = 5\text{sec}^{-1}$, PM = 40° and GM=10 db.

$G(s) = K / [s(s+1)(0.5s+1)]$ [16]

OR

Q.5 (a) Explain the effect of P, PI and PID controllers on the response of a second order system with the help of diagram. [10]

(b) Describe briefly the dynamic characteristics of PI, PD and PID controllers. How these are related to the different compensators? [6]
