Seat No._____

GANPAT UNIVERSITY

B. TECH. SEMESTER IV (EC) ELECTRONICS & COMMUNICATION ENGINEERING
REGULAR EXAMINATION, MAY/JUNE-2016

2EC 402:-Control Systems

TIME: 3 HOURS TOTAL MARKS: 60

INSTRUCTION:-

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

SECTION-I

Que.-1 (A) Unity feedback system has 6

$$G(s) = \frac{K}{s(s+2)(s+3)(s+4)}$$

Find the range of K for the stability of the system, using Routh's stability criteria.

(B) Check the stability using Hurwitz criterion 4

$$s^3 + 8s^2 + 14s + 24 = 0$$

OR

Que.-1 (A) Define Absolutely stable system. Discuss Relative stability with example. 5

(B) Find the stability of the system using Nyquist criterion 5

$$G(s)H(s) = \frac{1}{S(S+1)}$$

Que.-2 (A) Define the following terms: 3

(i) Bode plot
(ii) Phase margin
(iii) Gain crossover frequency

(B) Sketch the root locus for the system given below 7

$$G(s)H(s) = \frac{K}{S(S+2+2j)(S+2-2j)}$$

OR

Que.-2 (A) Sketch the asymptotic bode plot for the transfer function, 7

$$G(s)H(s) = \frac{2(S+0.25)}{S^2(S+1)(S+0.5)}$$

From the bode plot determine
(i) Phase crossover frequency (ii) Gain crossover frequency (iii) Gain Margin (iv) Phase Margin (v) Stability.

(B) Draw polar plot for following transfer function

$$G(s)H(s) = \frac{100}{(s+2)}$$

Que.-3 (A) The characteristics equation of a feedback system is, 7

$$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16$$

Using the R-H criterion, determine the stability of the system. Also find no. of roots in RHP,LHP & on the jω axis

(B) What is root locus method? List the rules to sketch the root locus. 3

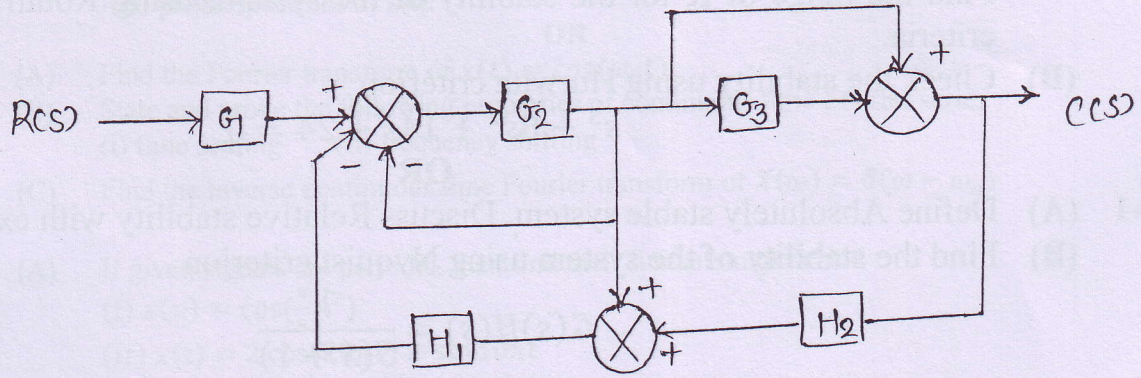
SECTION-II

Que.-4 (A) Draw the Signal flow graph of the below system given in block diagram & verify the result by using Mason's gain formula. 5

(B) Obtain the transfer function of a field controlled DC Servomotor. 5

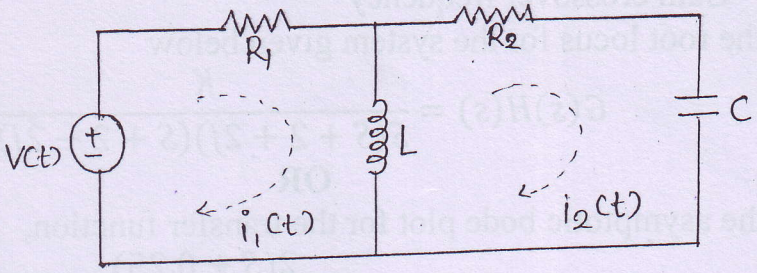
OR

Que.-4 (A) Determine the overall transfer function(C/R) of the system shown in figure by block diagram reduction technique. 5



(B) Give classification of control systems and explain in detail. 5

Que.-5 (A) Find the transfer function of the electrical network shown in figure. 4



(B) What is steady state error? Derive static error coefficients. 4

(C) Explain in detail: poles and zeros of the transfer function. 2

OR

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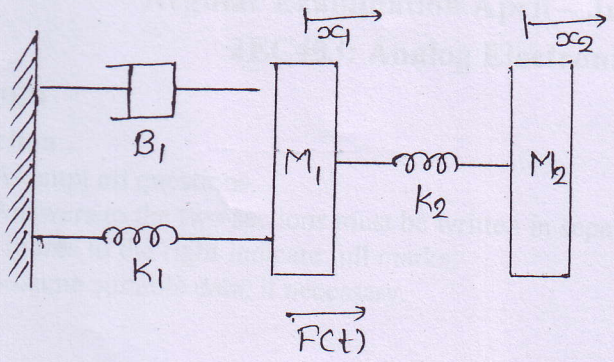
Que.-5 (A) Obtain differential equations describing the mechanical system shown in figure, and draw the electric network using Force-Voltage analogy. 5



(B) Differentiate: block diagram algebra and signal flow graph. 3

(C) What is stability? How it can be observed from given transfer function? 2

Que.-6 (A) Define following terms: 5

1) Transient response
2) Steady state response
3) Servomechanism
4) Self loop
5) Control system

(B) Discuss the various steps involved in designing any control system. 3

(C) Explain relation between impulse response and transfer function. 2

END OF PAPER
