

GANPAT UNIVERSITY
B.TECH SEM: VI ME
REGULAR EXAMINATION- MAY/JUNE-2012

ME601 CONTROL SYSTEM ENGINEERING

TIME: 3 HOURS

TOTAL MARKS: 70

INSTRUCTIONS:-

1. All questions are compulsory.
2. Answers of two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data wherever necessary.

SECTION – I

Q-1

- A. An automated control system is deployed for the manufacturing of automobile parts. [6]
Explain the importance of frequency response analysis for quality control of said plant.
- B. What is Fuzzy Logic and Fuzzy Controller ? Describe Typical Fuzzy Motion Control. [6]

OR

Q-1

- A. Explain Servo and Synchro Mechanism with their typical transfer functions [6]
- B. Explain the role of Actuators in Control Systems. describe working of LVDT [6]

Q-2

- A. Draw Bode Diagram for following transfer function [6]

$$G(s)H(s) = 27 \frac{(s + 1)}{(s + 4)}$$

- B. What is Control Relay ? Explain working and applications of Mechanical Relay [5]

OR

Q-2

- A. Explain Nyquist stability Criteria. State general procedure to draw Nyquist Plot [6]
- B. Describe transfer function of Field Controlled D.C. Motor. [5]

Q-3 Attempt any Three

[12]

- A. Classify hydraulic Actuators.
- B. Explain need and applications of Root Locus Technique.
- C. What information can be derived from Gain Plot & Phase Plot of a Bode Diagram ?
- D. Compare Time & Frequency Domain analysis for second order Control System.

SECTION-II

Q-4

- A. Explain the importance of Control Engineering in Mechanical Systems. with neat diagram, explain closed loop feedback control system. [6]
- B. Explain Force – Voltage analogy using suitable example [6]

OR

Q-4

- A. Explain proportional control circuit for pneumatic system. Derive its transfer function [5]
- B. An unity feedback system has a loop transform function [6]

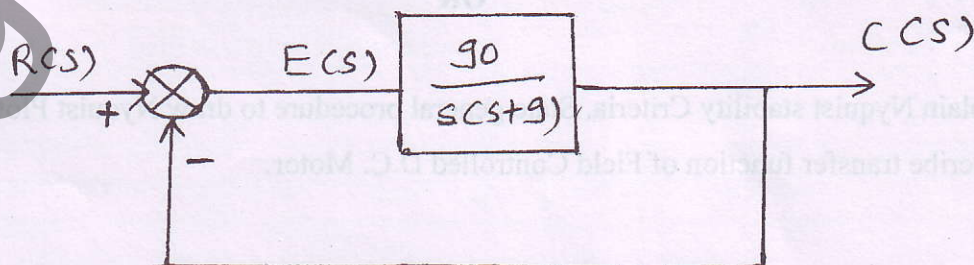
$$G(s) = 10 \frac{(s + 1)}{s(s + 2)(s + 5)}$$

Determine.

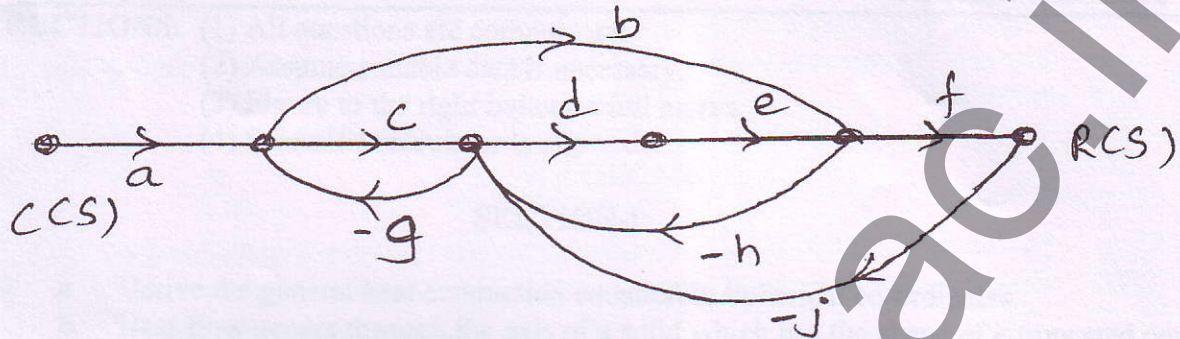
- (i) Step, ramp, parabolic error co-efficients
- (ii) Steady state error when $r(t) = 3 + 10t$

Q-5

- A. For feedback system shown in fig.1, find rise time peak time, maximum overshoot and setting time for a unit step input. [6]



B. Obtain transfer function of the system represented in fig.2 [5]



OR

Q-5 [5]

A. Find out the stability of the system if characteristic equation is given by

a) $S^4 + S^3 + 4S^2 + 6S + 9 = 0$

b) $S^3 + 3S^2 + 6S + 4 = 0$

B. Explain following term in detail. Show them on a typical diagram. [6]

- 1) Gain Margin
- 2) Phase Margin
- 3) Response Peak
- 4) Bandwidth
- 5) Cutoff Frequency
- 6) Resonance Frequency

Q-6 Attempt Any Three [12]

1. Find inverse Laplace Transform of

$$F(s) = \frac{4s + 24s^2}{s^3 + 4s^2 + 12s}$$

2. Describe the Applications of Time Domain Analysis in Mechanical Systems.
3. Explain transient and steady state response of second order control system briefly.
4. Compare Block diagram reduction techniques with signal flow graph.