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Total No. of Questions : 5]

[Total No. of Printed Pages : 4

5. a) What do you mean by state space representation?
b) Write down the relation between state equation and transfer function.
c) Why state space analysis is useful?
d) Check the observability of the below given system

$$\dot{x}_1 = x_2, \quad \dot{x}_2 = -2x_1 - 3x_2 + 4 \quad \text{and} \quad y = x_1 + x_2$$

OR

What do you mean by transfer function decomposition, also discuss about direct decomposition.

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Roll No

EC-502

B.E. V Semester

Examination, December 2016

Control Systems

Time : Three Hours

Maximum Marks : 70

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each question are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.

1. a) What do you mean by take off point in block diagram representation.
b) What is regenerative feedback.
c) Compare positive and negative feedbacks.
d) What do you understand by modeling of electrical systems. Explain force-voltage analogy with electrical circuit.

OR

Reduce the block diagram, shown in figure 1, into a form having one block in the forward path and one in feedback path.

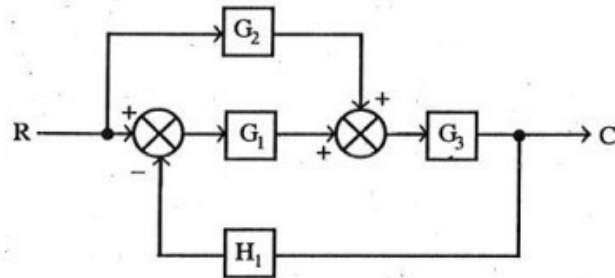


Figure 1

2. a) What are linear systems.
- b) How, adding poles to closed loop system, affects.
- c) Compare transient and steady state responses.
- d) Explain and derive mathematical equations for time response of a II order control system subjected to impulse input function.

OR

Using Nyquist criterion investigate the closed loop stability of the system whose open loop transfer function is

$$G(s)H(s) = \frac{K(s+1)}{(s+0.5)(s-2)}$$

Consider $K = 1.25$

3. a) List the applications of bode plots.
- b) Define gain margin.
- c) What is all pass transfer function.

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- d) Find out the correlation between transient response and frequency response.

OR

The open loop transfer function of a unity feedback control system is given as

$$G(s) = \frac{10Ke^{-sT}}{s(s+1)(s+7)}$$

for $K = 1$, determine T such that the system is marginally stable.

4. a) What is series compensation.
- b) What is phase lead compensation?
- c) List the various design specification.
- d) How a PD control affects the performance of a control system? Discuss with a suitable diagram.

OR

Determine the pulse transfer function for the system represented by block diagram as shown in figure 2.

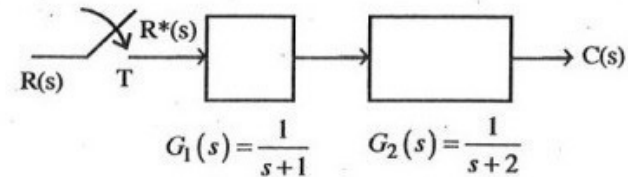


Figure 2