d) Explain the different types of compensation network in details.

OR

Find the Z-transform of the following functions:

i) $f(t) = u(t) - e^{-2.t}$

ii) $f(t) = (1 - e^{-5.t})$, Sampling time T = 0.2 sec.

Unit-V

5. a) What are the advantages of state space approach over transfer function as well as graphical approach for the analysis of control system?

b) Write short note on state space and state variable.

c) Explain the relationship in between the state equation and transfer function.

d) Explain the concept of Controllability and Observability in detail.

OR

The transfer function of a system is given by $\frac{Y(s)}{U(s)} = \frac{s^2 + 3.s + 2}{s^3 + 9.s^2 + 26.s + 24}$. Determine the state model by using direct decomposition method.

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Roll No .....

EC - 502

B.E. V Semester

Examination, December 2015

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 questions 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.

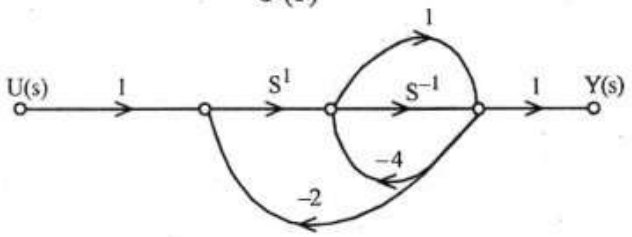
Unit-I

1. a) Write down the advantages and disadvantages of transfer function approach.

b) Write a short note on Manson's Gain Formula which is used for solving signal flow graph.

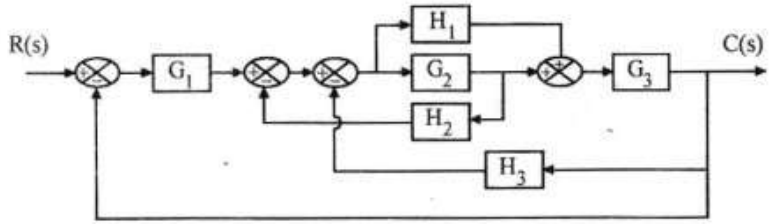
c) What are the basic differences between open and closed loop control system and which one is preferred mostly and why?

d) The signal flow graph for a system is given below. Find the transfer function $\frac{Y(s)}{U(s)}$



OR

Determine $\frac{C(s)}{R(s)}$ by reducing the block diagram for the system given below.



Unit-II

2. a) Write a short note on Steady state error.
   b) Explain the concept of Relative Stability and Absolute Stability.
   c) Write a short note on standard test signals for analyzing the time response of any control system.
   d) For a unity feedback control system the forward path gain $G(s)=\frac{K}{s(s+2)(s^2+2s+2)}$, then find the value of K for which the Root-locus crosses the imaginary axis and also find the value of angle of departure for complex roots.

OR

For a unity feedback control system having its forward path transfer functions as, $G(s)=\frac{20}{(s+1)\cdot(s+5)}$.

Determine characteristic equation of the system ω_n, ω_d, t_p, M_p, damping factor and time at which First overshoot occurs.

Unit-III

3. a) Explain the term Gain Margin.
   b) Write a short note on the advantages of Bode plot.
   c) The limitation of root locus analysis is over come by Bode plot, this sentence is true or false, explain in detail.
   d) A unity feedback control system with open loop transfer function $G(s)=\frac{50(s+60)}{(s+2)(s+10)}$. Draw the bode plot and also, find the gain Crossover frequency, phase crossover frequency, gain margin as well as phase margin.

OR

Draw the Nyquist plot for $G(s)\cdot H(s)=\frac{1}{s^2(1+sT_1)(1+sT_2)}$ and make a comment on stability.

Unit-IV

4. a) Write a short note on Compensation Networks.
   b) Write down the advantages of phase lead-lag compensation network.
   c) Explain the PID controller in details.