P3632

APR-15/ENGG.-117

T.E. (Electrical) (In Sem - Semester - II)

CONTROL SYSTEM - I
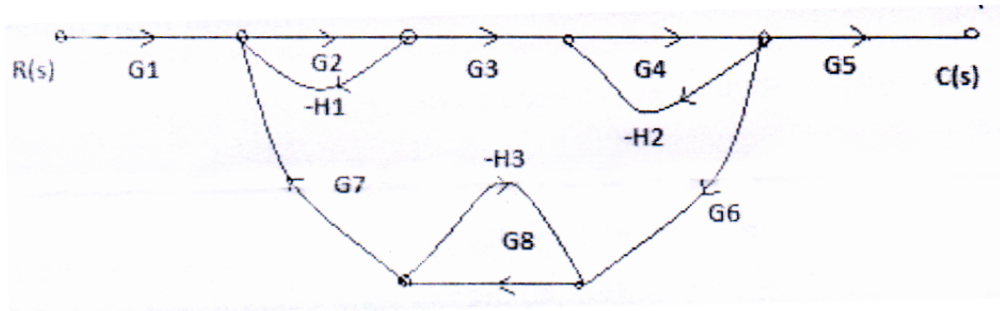
(2012 Pattern)

*Time : 1 Hour]*

[Max. Marks : 30

Instructions to the candidates:

1) *Use of non programmable calculator is allowed.*
2) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) Compare open loop and closed loop system. **[4]**

b) Obtain the transfer function of the signal flow graph given below. **[6]**

OR

Q2) a) Define the following control systems and give example of each. **[3]**

i) Tracking Control System,

ii) Regulator Control System and

iii) Feed Forward Control System

b) Obtain the transfer function of the block diagram given below. **[7]**
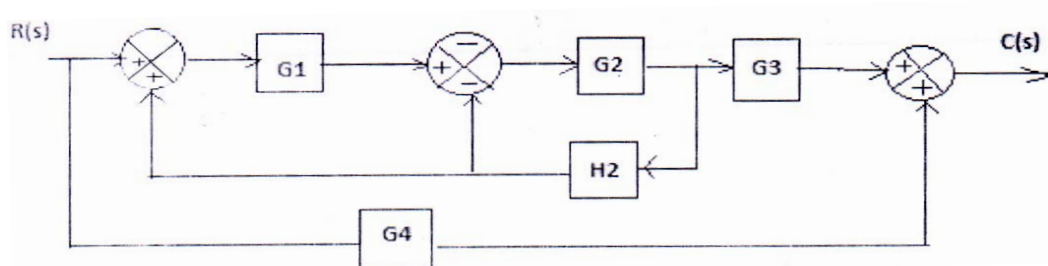
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Q3) a) What is a lag network? Obtain the transfer function of lag network. **[4]**

b) Obtain the block diagram representation of armature control DC servo motor with output as angular velocity (W) and input as armature voltage (V_a). Consider following parameters for transfer function R_a-Armature resistant (ohm), L_a-armature inductance (H), V_a-Armature voltage (V), E_b-Back emf (V), l_a-armature current (A), W-Angular velocity (rad/sec), T-Torque (Nm), J-Moment of inertia (Kg m²), K_t-back emf and torque constant (Vsec/rad), B-load torque friction constant. **[6]**

OR

Q4) a) Explain AC servomotor working characteristics features and its transfer function. **[6]**

b) Explain potentiometer and potentiometer as error detector. Obtain the transfer function of potentiometer. **[4]**

Q5) a) Write short note on dominant closed loop poles of higher order system.**[3]**

b) Consider the system given below. Obtain closed loop transfer function and determine (i) Rise time, (ii) Peak Time, (iii) Maximum Overshoot (iv) Settling time and (v)Delay Time. **[7]**

$$G(s) = \frac{136}{s^2 + 16s + 136}$$

OR

Q6) a) Draw the standard test signals. Write their mathematical representations and Laplace transform. **[4]**

b) A second order system is represented by the transfer function

$$\frac{W(S)}{T(S)} = \frac{1}{Js^2 + fs + k}$$

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A step input of 10 Nm is applied to the system and the test results are (i) Maximum overshoot 6 %, (ii) Peak time 1 sec, (iii) Steady state value of output is 0.5 rad. Determine values of J, f and k. **[6]**

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