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Roll No.

SIXTH SEMESTER

B.Tech (Engineering Physics).

MID SEMESTER EXAMINATION

March, 2019

EP 314 Instrumentation & Control

Time: 1:30 Hours

Max. Marks: 25

Note: Answer all *four* questions.
Assume suitable missing data, if any.

1. (a) A single input single output system with y as output and x as input, is describe by

$$d^2y/dt^2 + 2dy/dt + 10y = 5dx/dt - 3x$$

For an input $x(t)$ with zero initial conditions the above system produces the same output as with no input and with initial conditions $dy(0^-)/dt = -4$ and $y(0^-) = 1$, find $x(t)$. 3.5

(b) A linear network has the system function

$$T(s) = K(s+c)/(s+a)(s+b)$$

The outputs of the network with zero initial conditions for two different inputs are tabled as

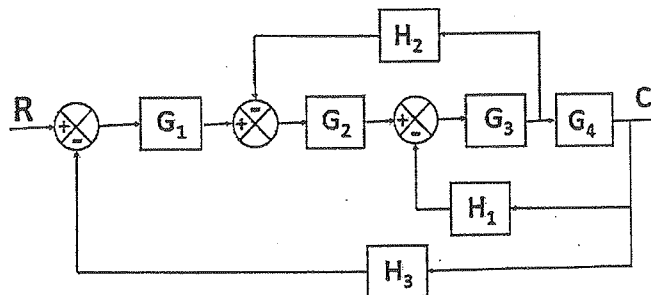
Input $x(t)$	Output $y(t)$
$u(t)$	$2 + De^{-t} + Ee^{-3t}$
$e^{-2t}u(t)$	$Fe^{-t} + Ge^{-3t}$

Then find the values of c and K . 3.5

2. (a) Construct the signal flow graph for the following set of simultaneous equations and find the transfer function of the system using Mason's gain formula. 3

$$x_2 = ax_1 + bx_3; \quad x_3 = cx_1 + dx_2 + ex_3; \quad x_4 = fx_2 + gx_3$$

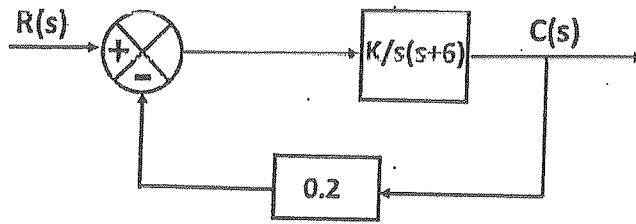
(b) Find C/R using block diagram reduction technique: 3



P.T.O.

3. (a) A closed loop control system is shown in figure below. The system is having a damping ratio of 0.7. Determine the value of K to satisfy this condition and calculate the setting time, peak time and maximum overshoot for that value of K.

3



- (b) A second order control system is represented by a transfer function given as $\theta_o(s)/T(s) = 1/(Js^2 + fs + K)$ Where θ_o is O/p and T is i/p. A step input of 10 Nm is applied to the system and test results are as (a) $M_p = 6\%$ (b) $t_p = 1$ sec. and (c) the steady state value of the output is 0.5 radian. Determine the value of J, f and K.

3

4. (a) Find the sensitivity S_K^T of the transfer function $T = (1+2K)/(3+4K)$ with respect to the parameter K.

3

- (b) The closed loop transfer function of a unity feedback control system is given by:

$$C(s)/R(s) = (Ks+b)/(s^2+as+b)$$

Determine the steady state error for unit ramp input.

3