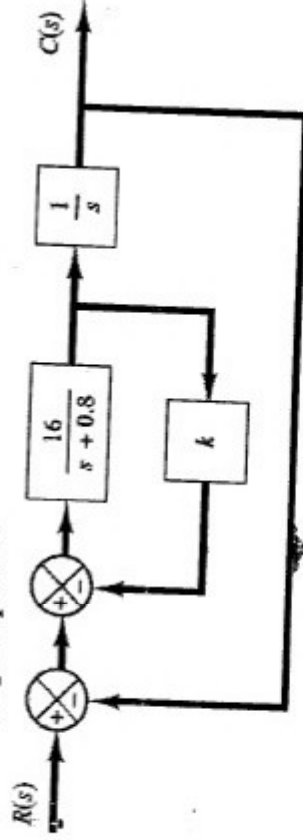




This exam measures ILOs no: a5.1, b2,b14,c3 ,e11

**Question No. 1 [20 Marks]**

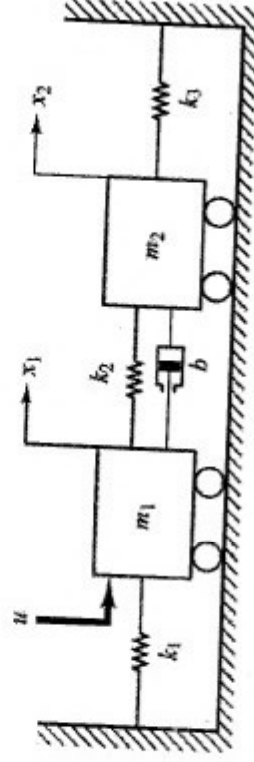
Consider the system shown in the following figure . Determine the value of  $k$  such that the damping ratio is 0.5. Then obtain the rise time  $t_r$  , peak time  $t_p$ , maximum overshoot  $M_p$ , and settling time  $t_s$  in the unit-step response.



**Question No. 2 [20 Marks]**

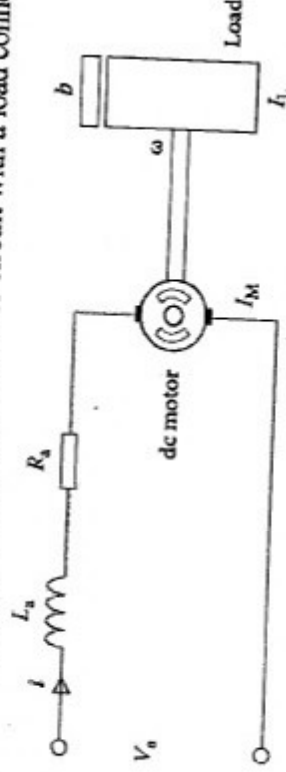
$$\frac{X_1(s)}{U(s)} \quad \frac{X_2(s)}{U(s)}$$

Obtain the transfer function  $\frac{X_1(s)}{U(s)}$  and  $\frac{X_2(s)}{U(s)}$  of the mechanical system shown in the following figure:



**Question No. 3 [15 Marks]**

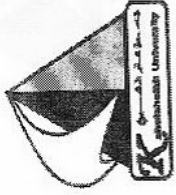
Derive an expression for the mathematical model of a dc motor circuit with a load connected to the motor shaft.



د/عبد الفتاح هويل

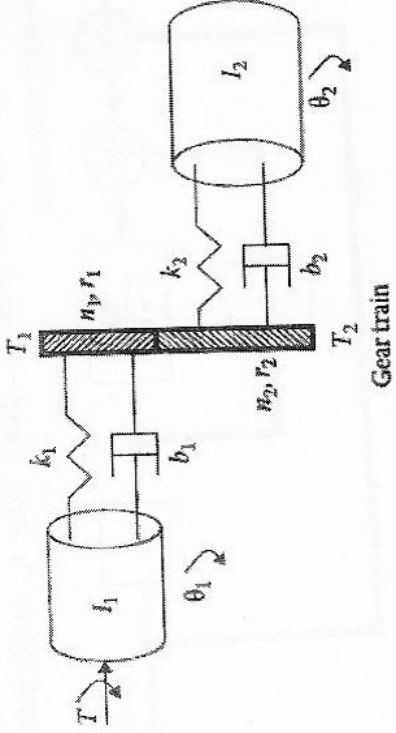
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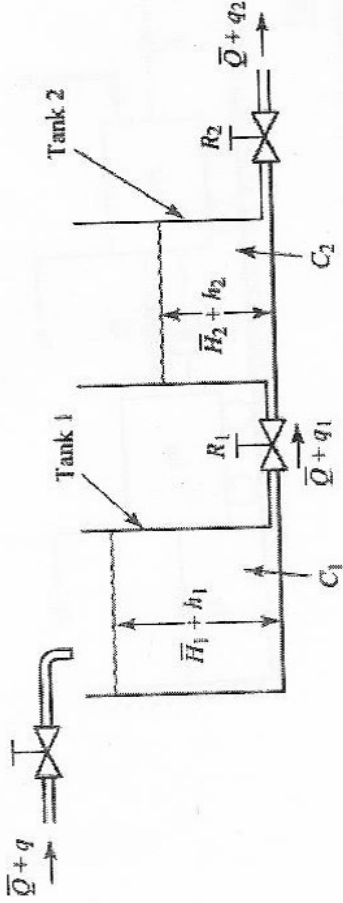
**Question No. 4 [15 Marks]**

For the following figure, drive the mathematical model for  $\frac{\theta_2}{T}$ .



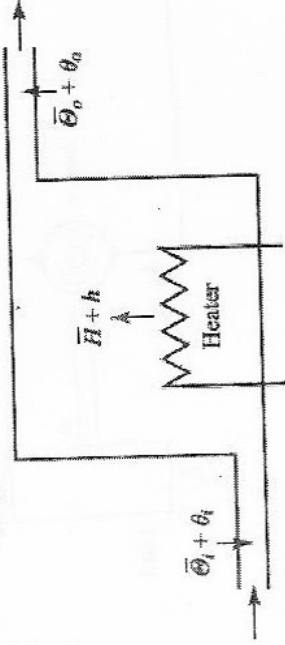
**Question No. 5 [15 Marks]**

Obtain the transfer function  $\frac{Q_2(S)}{Q(S)}$  and draw the block diagram of the liquid – level system shown in the following figure:



**Question No. 6 [15 Marks]**

Drive the transfer function  $\frac{\theta(S)}{\theta_i(S)}$  due to the change in temp. of both heater and inflow.



With my best wishes  
 Dr. Sherif Imam

د/عبد المنعم هادي  
 محمد لبيب