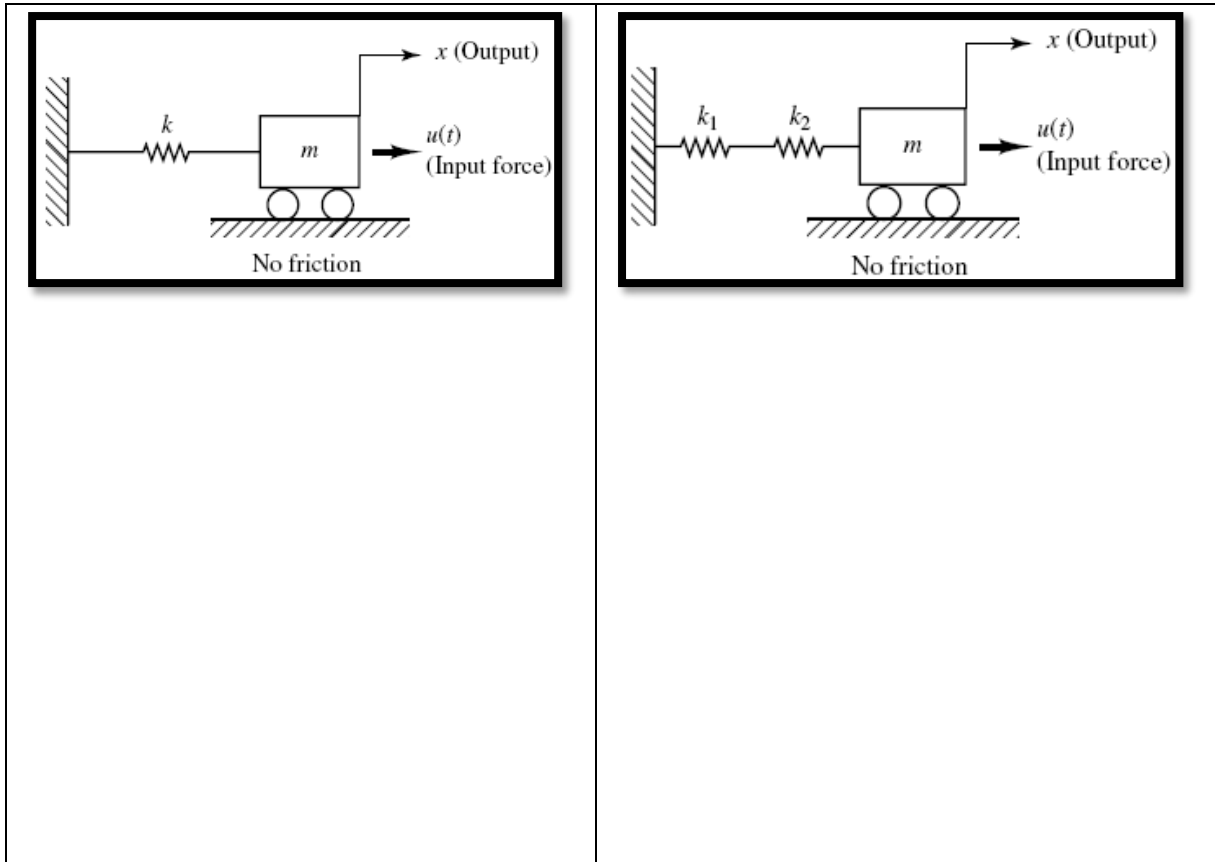


Control systems

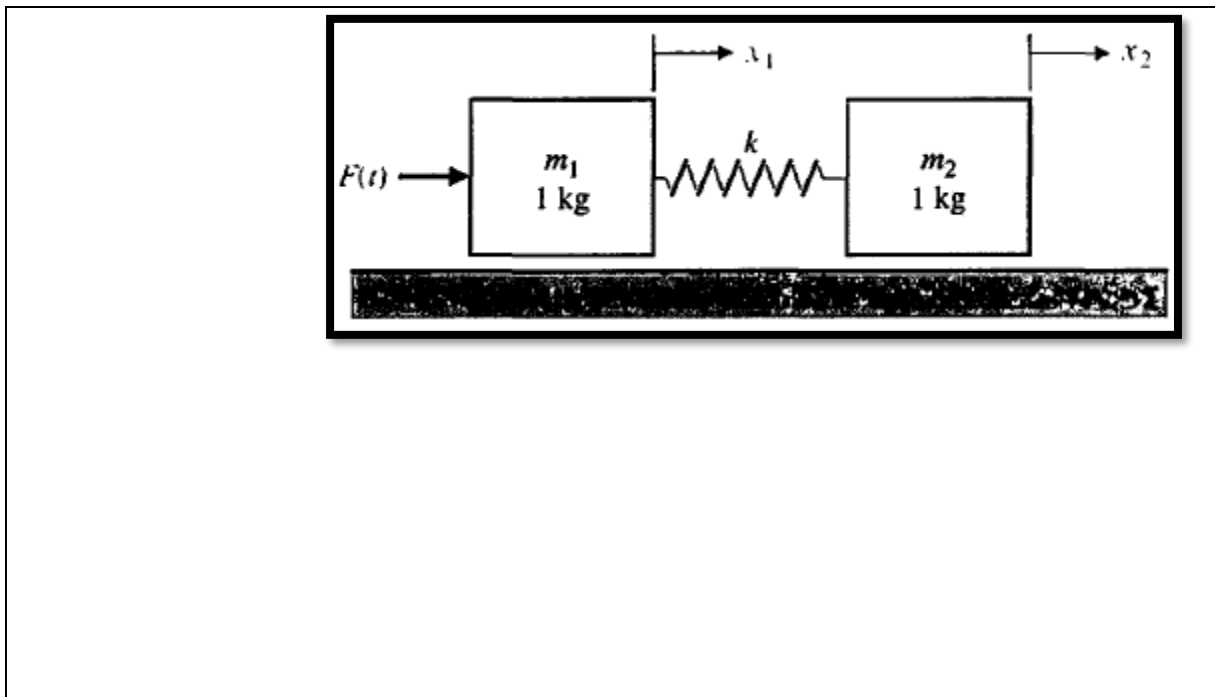
Course code: xxxx

Sheet 02 — Modeling translational motion

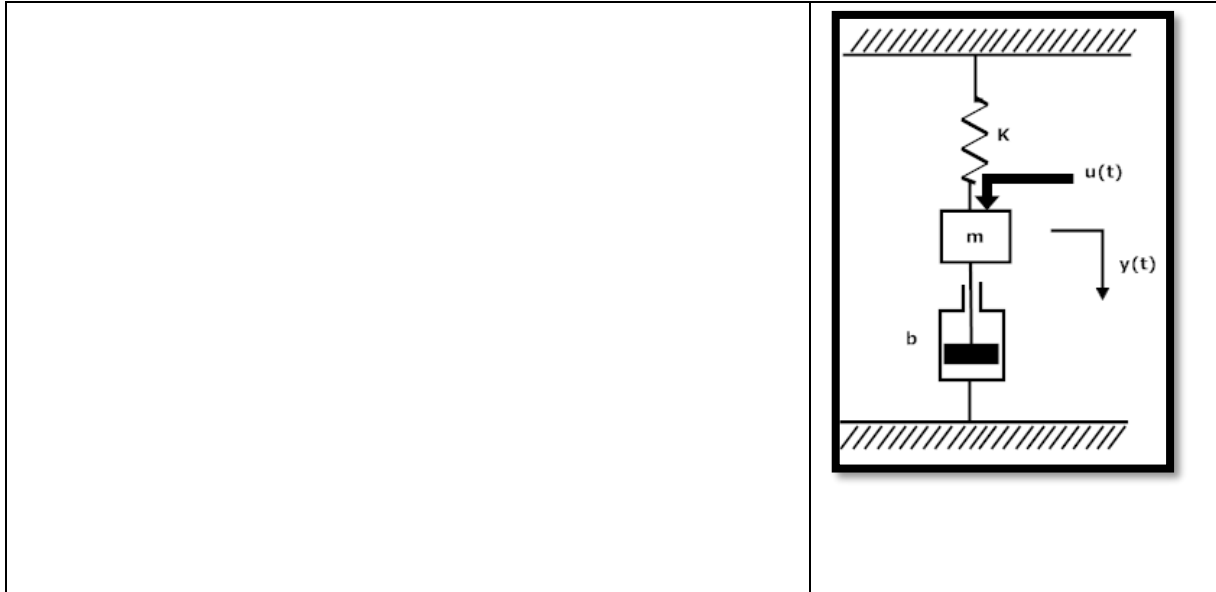
1. Obtain mathematical models of the mechanical systems shown in Figures below



2. Determine the transfer function $X_2(s)/F(s)$ for the system shown in Figure below. Both masses slide on a frictionless surface, and $k = 1 \text{ N/m}$.

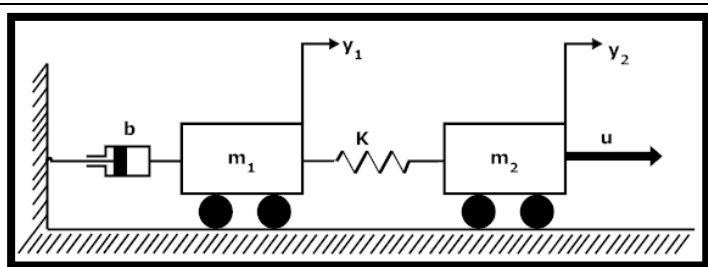


3. Consider the mechanical system shown in Fig. below. The external force $u(t)$ is the input to the system, and the displacement $y(t)$ of the mass is the output. Find the transfer function $Y(s)/U(s)$



4. For the mechanical system shown in fig. below

- Obtain the transfer function $Y_1(s)/U(s)$ and $Y_2(s)/U(s)$
- Draw the block diagram



5. A dynamic vibration absorber is shown in Fig. below. This system is representative of many situations involving the vibration of machines containing unbalanced components. The parameters M_2 and k_{12} may be chosen so that the main mass M_1 does not vibrate when $F(t) = a \sin \omega_0 t$
- (a) Obtain the differential equations describing the system
 - (b) Solve using MATLAB code
 - (c) Simulate using SIMULINK

