

**Ústav Aplikovanej Mechaniky a Mechatroniky
Strojnícka fakulta STU v Bratislave**

ZADANIE č. 2

Vyšetrovanie odozvy systému

Meno a Priezvisko:

Krúžok:

Zadanie č. 2

ZADANIE:

Ak uvažujeme **system** podľa variantu zadania. Odvodte diferenciálne rovnice daného systému s uvažovaním vstupných parametrov podľa nasledovnej Tab.

Tab.: Vstupné parametre mechanického systému

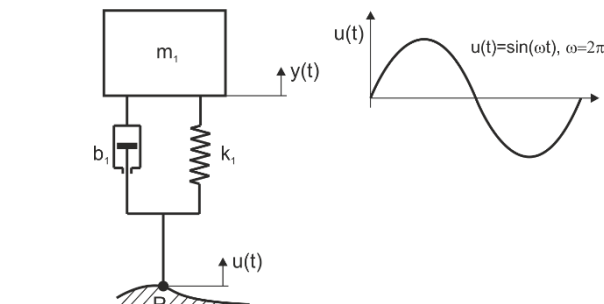
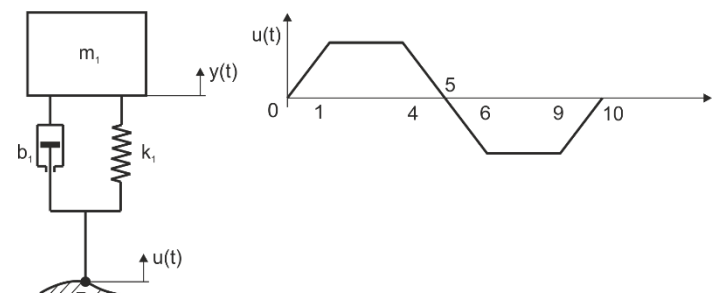
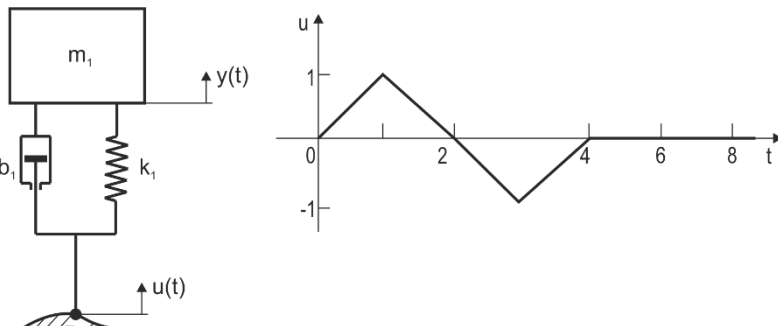
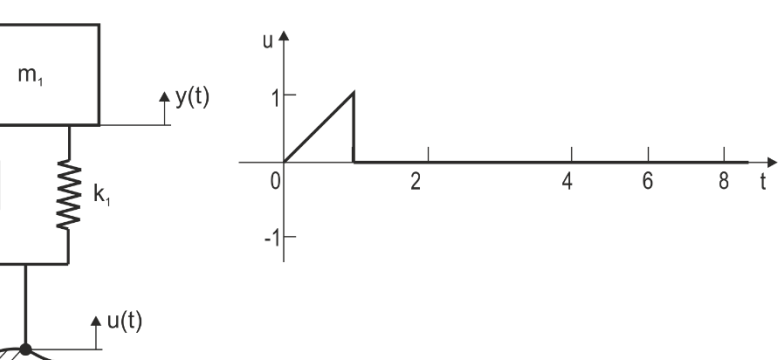
m_1 [kg]	m_2 [kg]	k_1 [N.m ⁻¹]	k_2 [N.m ⁻¹]	b_1 [N.s.m ⁻¹]	b_2 [N.s.m ⁻¹]	f [Hz]	F_0 [N]
3	5	1000	1500	10	15	10	100

Následne vykonajte dané úlohy zadania

1. Nájdite prenosovú funkciu systému
2. Analytickým spôsobom inverznou Laplaceovou transformáciou vypočítajte odozvu systému $y(t)$ na jednotkový vstup $u(t)=1$. Ak $Y(s)=G(s)*U(s)$. A porovnajte v Matlabe na grafoch s riešením použitím príkazu **step**.
3. Napíšte skript v Matlabe, v ktorom zadefinujete systém prenosovou funkciou systému a takisto budiaci signál $u(t)$. Určte v Matlabe odozvu systému na Vami zadaný signál podľa Variantu zadania príkazom **lsim**.
4. Napokon riešenie pre vstupný signál zobrazte na dvoch grafoch pod sebou pre **vstupný signál $u(t)$** a odozvu systému **výstupného signálu $y(t)$** .

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VARIANTY ZADANÍ

1.	 <p>Diagram of a mass-spring-damper system. A mass m_1 is supported by a spring k_1 and a damper b_1 in parallel. The base of the system is supported by a pivot P and is subjected to an input displacement $u(t)$. The output displacement is $y(t)$. The input $u(t)$ is a sinusoidal function: $u(t) = \sin(\omega t)$, $\omega = 2\pi f$.</p>
2.	 <p>Diagram of a mass-spring-damper system. A mass m_1 is supported by a spring k_1 and a damper b_1 in parallel. The base of the system is supported by a pivot P and is subjected to an input displacement $u(t)$. The output displacement is $y(t)$. The input $u(t)$ is a piecewise linear function defined by the following points: $(0, 0)$, $(1, 1)$, $(4, 1)$, $(5, 0)$, $(6, -1)$, $(9, -1)$, $(10, 0)$.</p>
3.	 <p>Diagram of a mass-spring-damper system. A mass m_1 is supported by a spring k_1 and a damper b_1 in parallel. The base of the system is supported by a pivot P and is subjected to an input displacement $u(t)$. The output displacement is $y(t)$. The input $u(t)$ is a triangular function defined by the following points: $(0, 0)$, $(1, 1)$, $(2, 0)$, $(3, -1)$, $(4, 0)$, and remains at 0 for $t > 4$.</p>
4.	 <p>Diagram of a mass-spring-damper system. A mass m_1 is supported by a spring k_1 and a damper b_1 in parallel. The base of the system is supported by a pivot P and is subjected to an input displacement $u(t)$. The output displacement is $y(t)$. The input $u(t)$ is a ramp function defined by the following points: $(0, 0)$, $(1, 1)$, and remains at 1 for $t > 1$.</p>

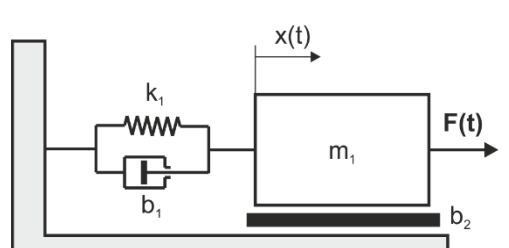
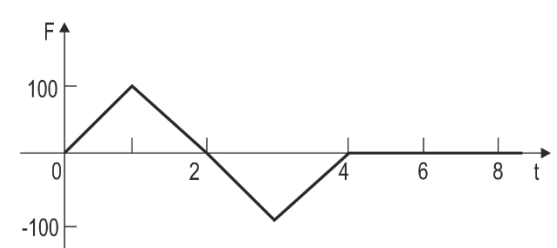
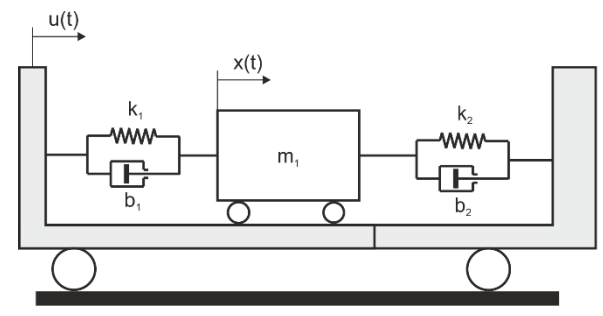
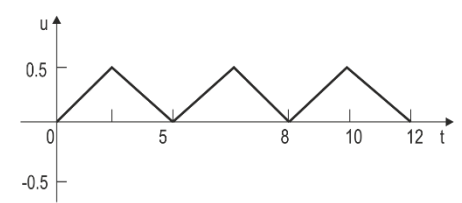
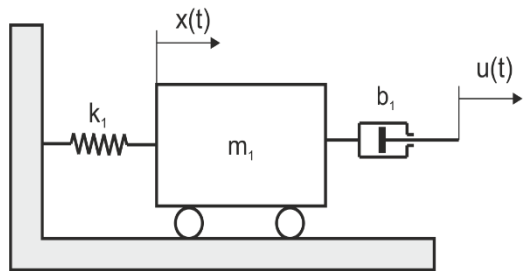
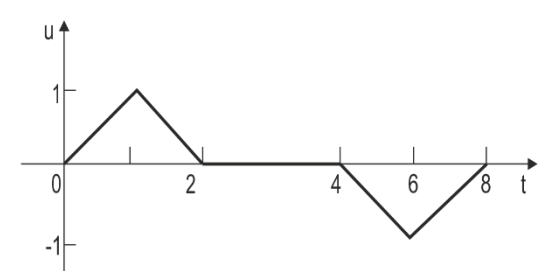
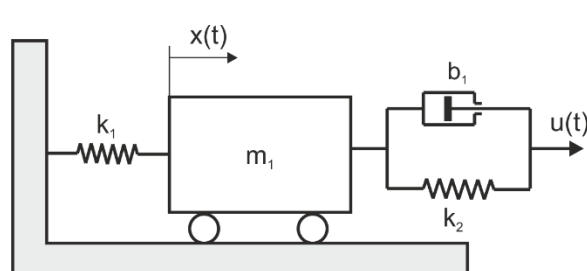
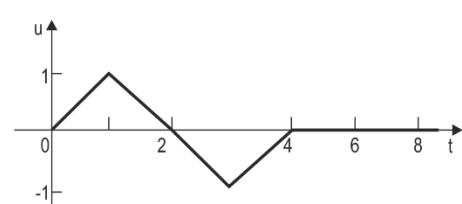
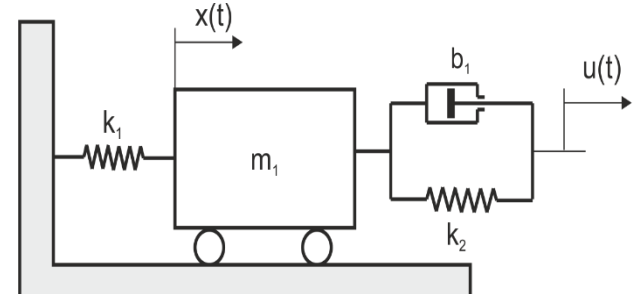
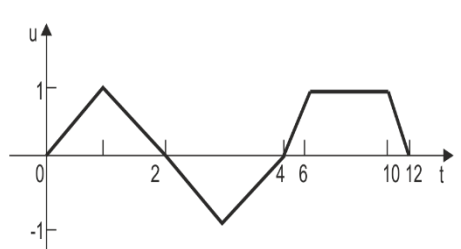
Zadanie č. 2

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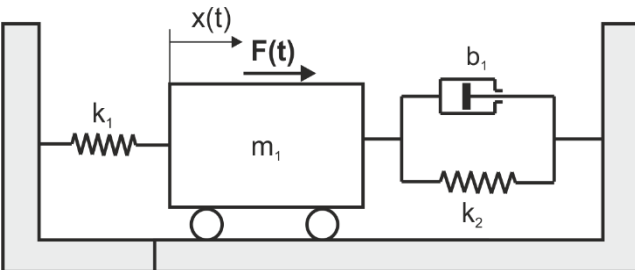
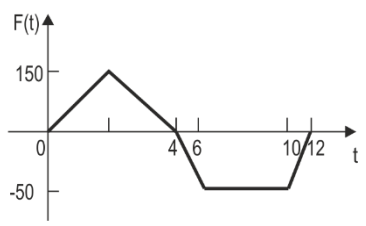
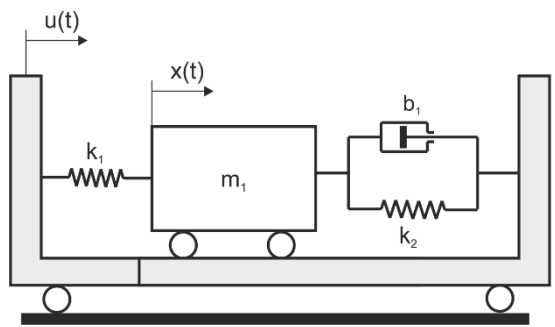
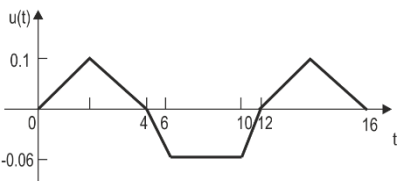
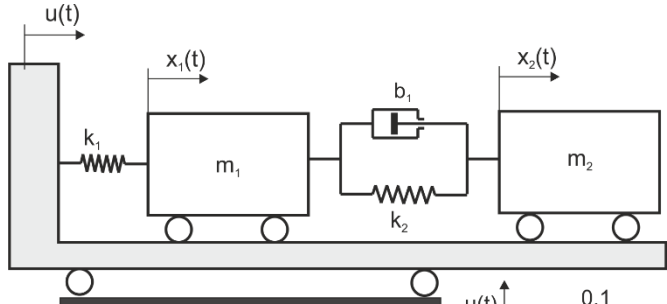
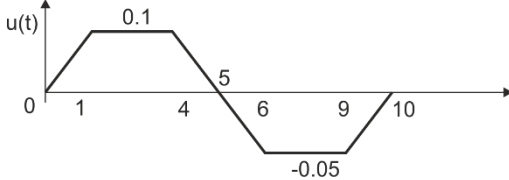
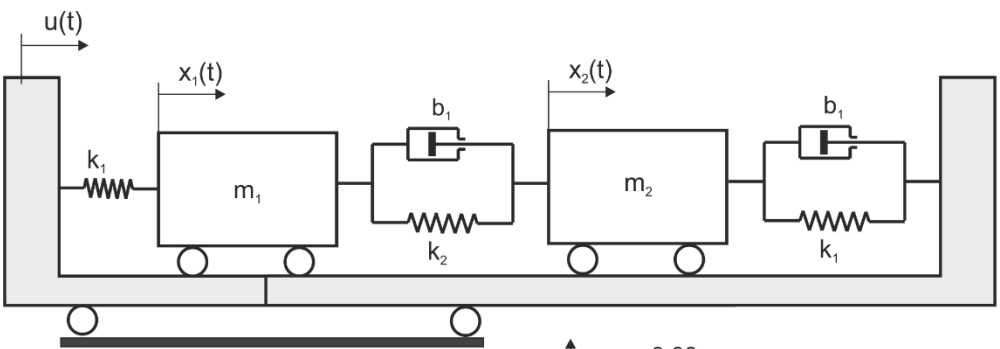
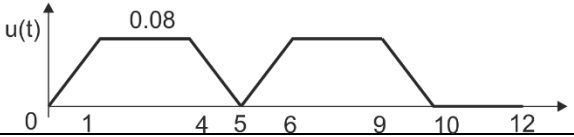
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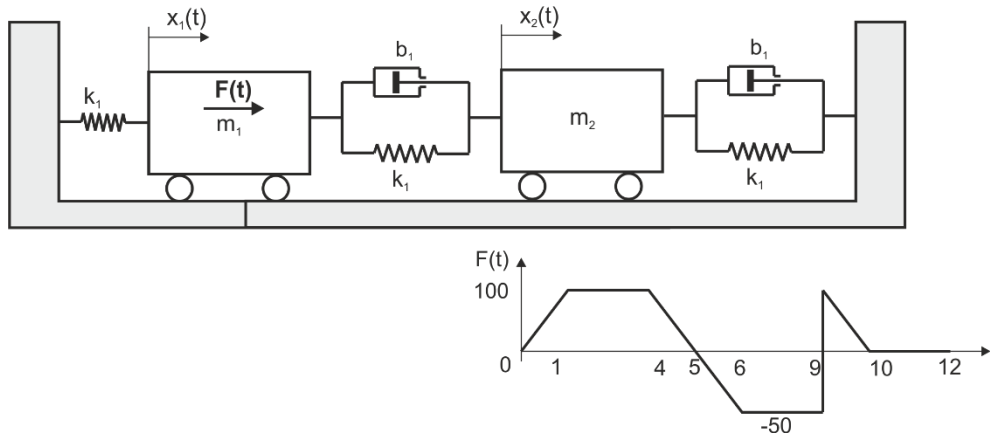
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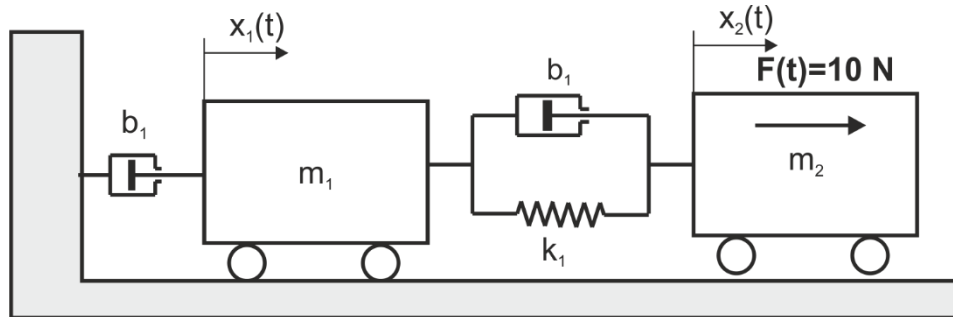
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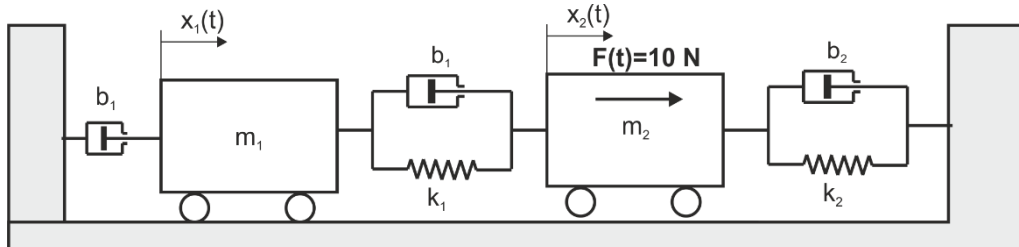
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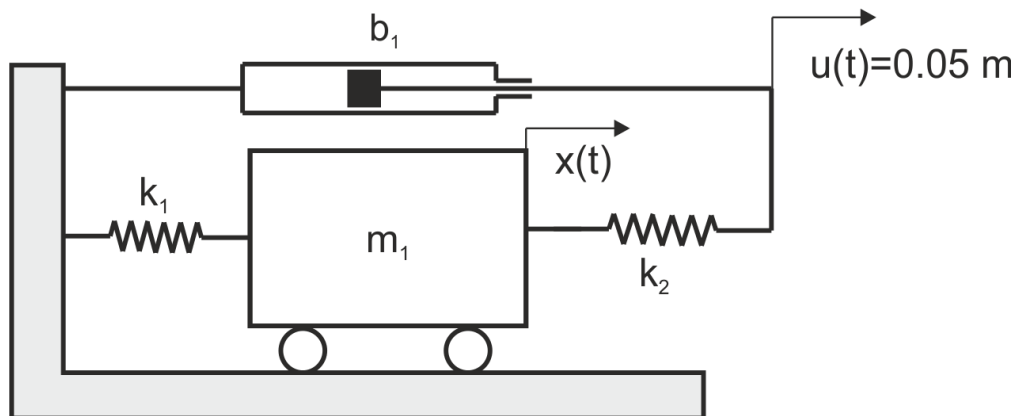
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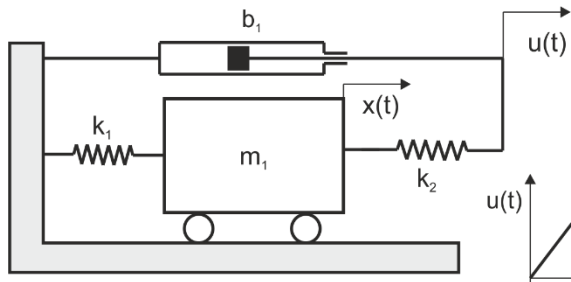
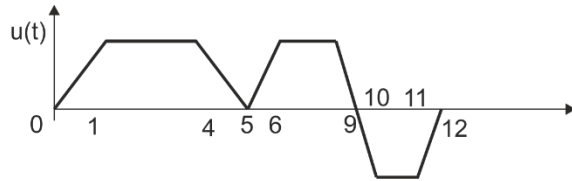
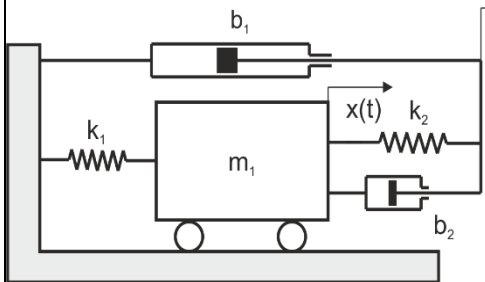
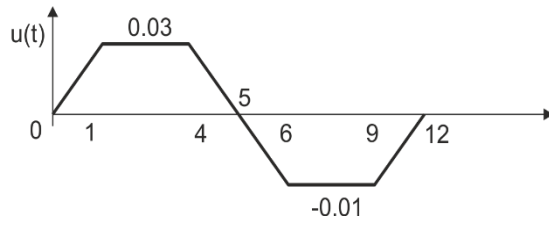
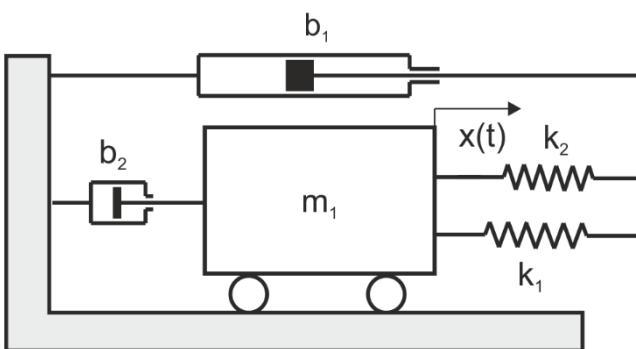
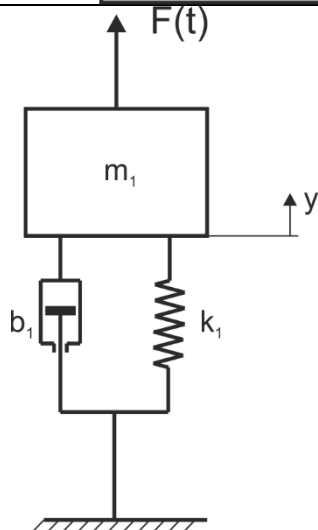
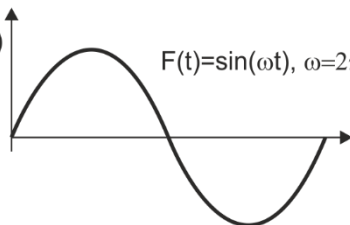
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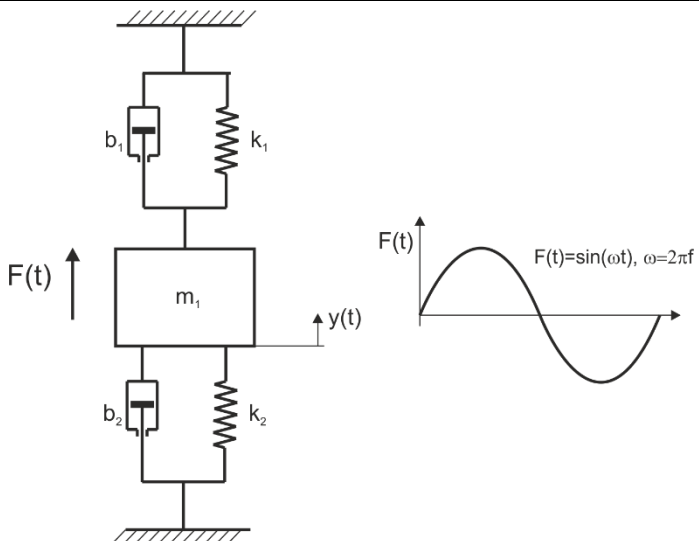
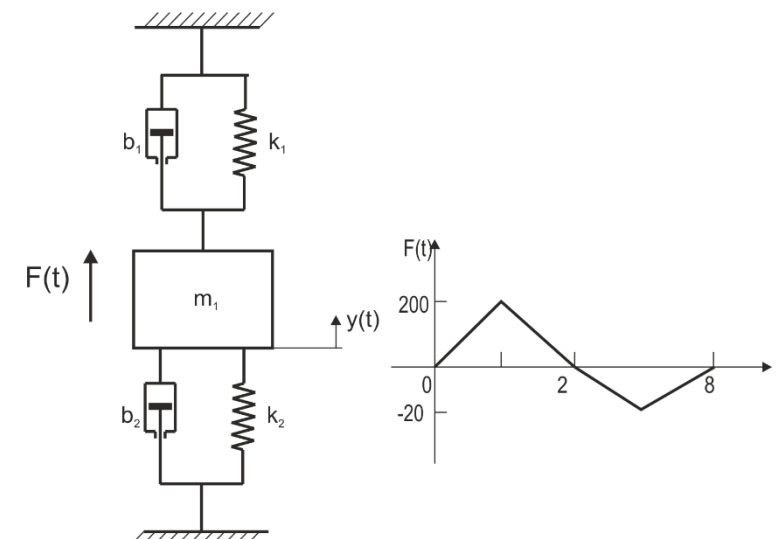
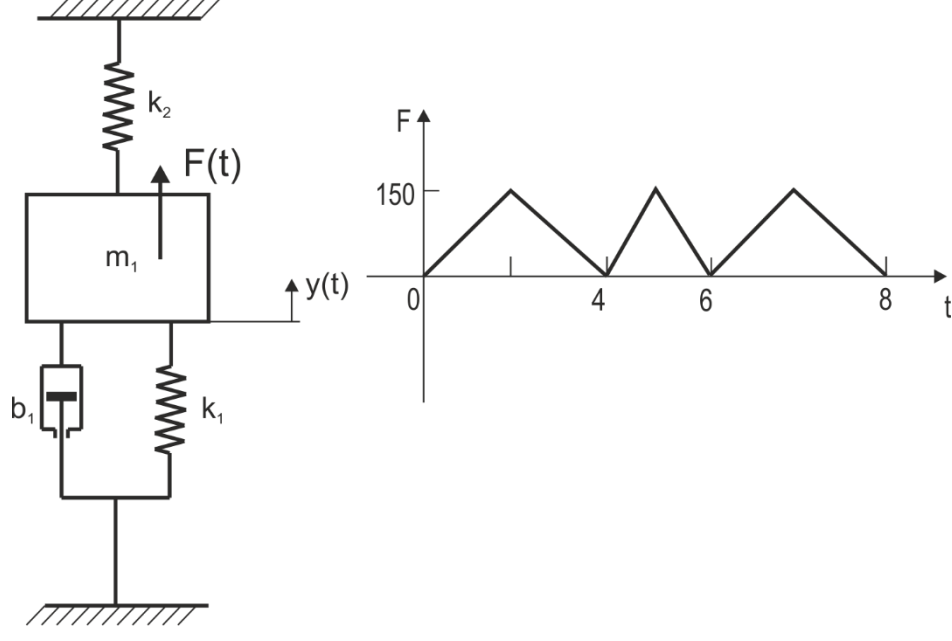
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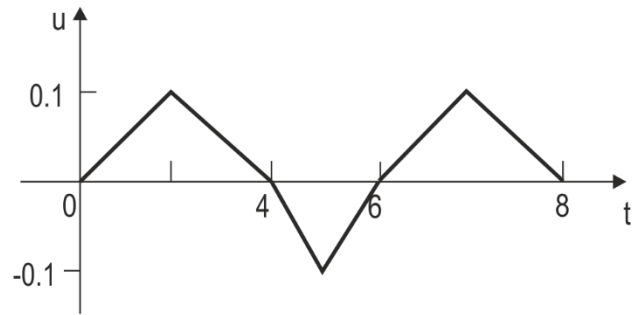
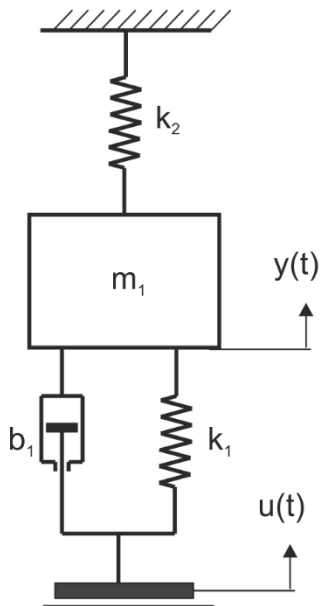
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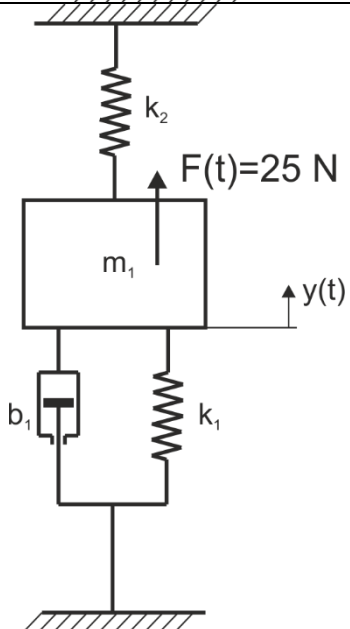
30.	 <p>Diagram of a mass-spring-damper system. A mass m_1 is suspended from a fixed ceiling. The mass is connected to the ceiling by a parallel combination of a damper b_1 and a spring k_1. The mass is also connected to a fixed ground by a parallel combination of a damper b_2 and a spring k_2. An upward force $F(t)$ is applied to the mass. The displacement of the mass is denoted by $y(t)$. To the right, a graph shows a sinusoidal force $F(t) = \sin(\omega t)$, with $\omega = 2\pi f$.</p>
31.	 <p>Diagram of a mass-spring-damper system, identical in structure to problem 30. The mass m_1 is suspended from a fixed ceiling by a parallel combination of a damper b_1 and a spring k_1, and connected to a fixed ground by a parallel combination of a damper b_2 and a spring k_2. An upward force $F(t)$ is applied to the mass. The displacement is $y(t)$. To the right, a graph shows a triangular force $F(t)$ over time t. The force starts at 0 at $t=0$, increases linearly to a peak of 200 at $t=1$, decreases linearly to -20 at $t=2$, increases linearly to 0 at $t=3$, decreases linearly to a trough of -20 at $t=4$, increases linearly to 0 at $t=5$, decreases linearly to -20 at $t=6$, increases linearly to 0 at $t=7$, and finally decreases linearly to -20 at $t=8$.</p>
32.	 <p>Diagram of a mass-spring-damper system. A mass m_1 is connected to a fixed ceiling by a spring k_2. The mass is also connected to a fixed ground by a parallel combination of a damper b_1 and a spring k_1. An upward force $F(t)$ is applied to the mass. The displacement is $y(t)$. To the right, a graph shows a sawtooth force $F(t)$ over time t. The force starts at 0 at $t=0$, increases linearly to a peak of 150 at $t=1$, decreases linearly to 0 at $t=2$, increases linearly to a peak of 150 at $t=3$, decreases linearly to 0 at $t=4$, increases linearly to a peak of 150 at $t=5$, decreases linearly to 0 at $t=6$, increases linearly to a peak of 150 at $t=7$, and finally decreases linearly to 0 at $t=8$.</p>

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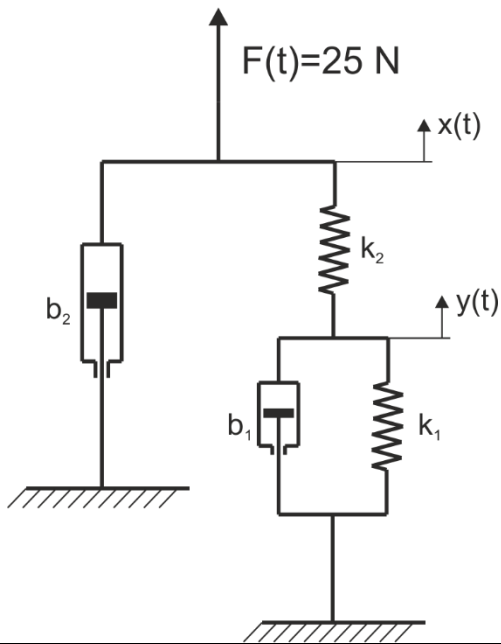


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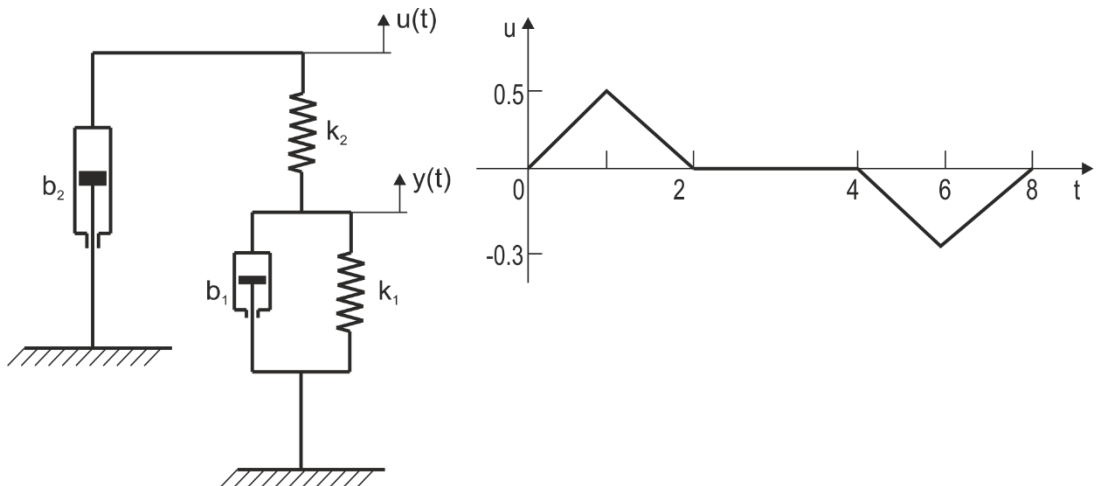


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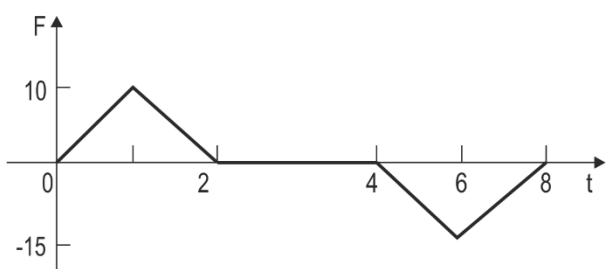
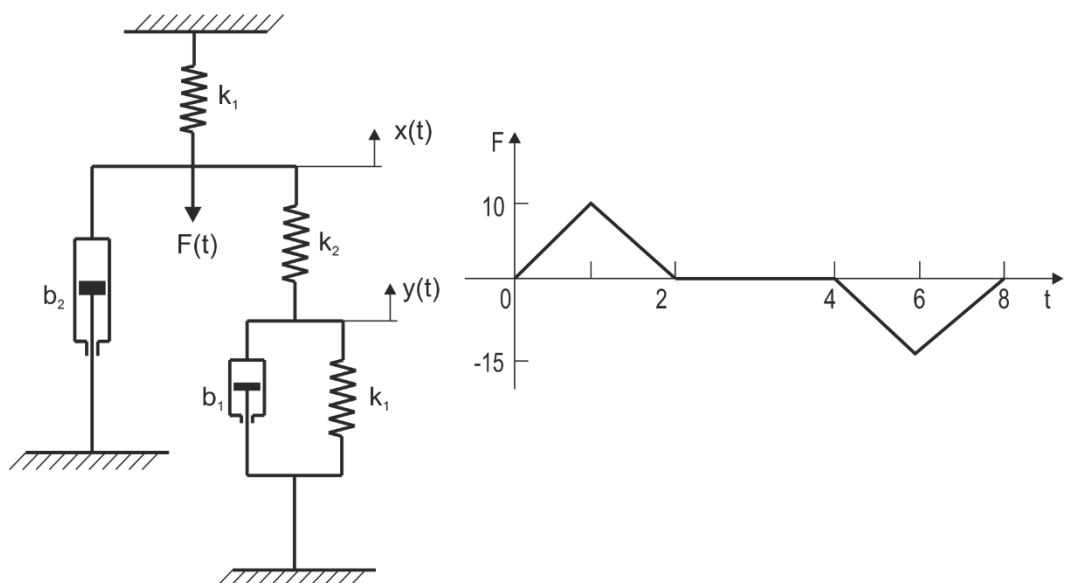
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