Question 1 5 pts

If the net force on a 3 kg mass is 2 N, the acceleration in m/s^2 is

- 2/3
- 3/2
- 6
- None Above

Question 2 5 pts

If the initial kinetic energy of a 2 kg mass is 5 J, and a constant force of 3 N is applied over a distance of 5 M, the final kinetic energy in J is

- 30
- 20
- None Above
- 25

Question 3 5 pts

The volume of 1/2 mole of ideal gas at a pressure of 100 kPa and at 300 K is 12.45 L.

- True
- False

Question 4 5 pts

A sound pressure level of 0.02 Pa rms, would correspond to a level L_p in dB_{SPL} units of

- 30
- 40
- 60
- None Above

Question 1 — 5 pts

The Laplace poles of an undamped spring+mass mechanical oscillator (without any damper) are unstable.

- ○ True
- ○ False

Question 2 — 5 pts

In a spring+mass+damper system under the force of gravity as in our handouts, with m=0.1 kg, k=0.4 N/m, r=0.01 N/(m/s), and initial conditions z(0)=-3 m, and v(0)=0, the natural frequency of the system is ω_0 =

- ○ 2 rad/s
- ○ 1/2 rad/s
- ○ 4 rad/s
- ○ 1/4 rad/s
- ○ None Above

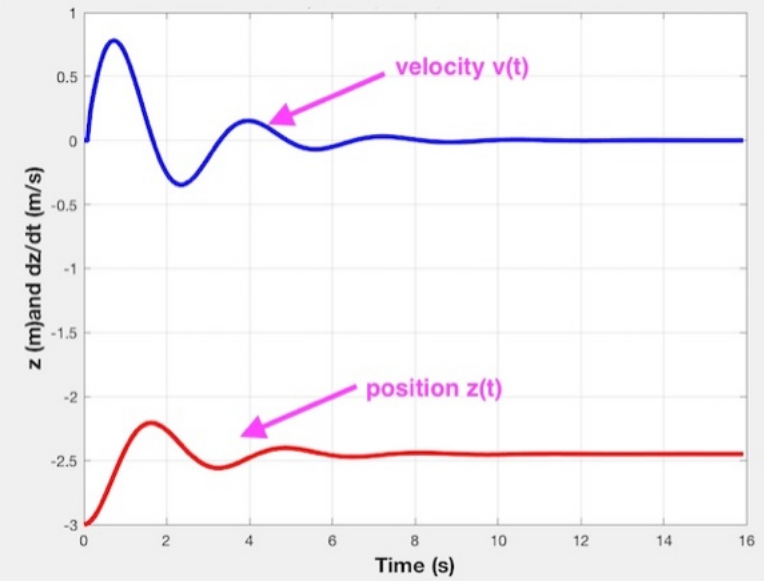
Question 3 — 5 pts

In a spring+mass+damper system under the force of gravity as in our handouts, with m=20 kg, n=5 m/N, r=0.4 N/(m/s), and initial conditions z(0)=-3 m, and v(0)=0, the Q of the system is Q=

- ○ 10
- ○ 5
- ○ 4
- ○ None Above

Question 4

5 pts



For the transient response of the spring+mass+damper shown above, the position of the static equilibrium point is most nearly at z=

- -2.5 m
- 0 m
- -1 m
- None Above

Question 1 5 pts

The mechanical impedance in N/(m/s) of a 3 kg mass at a frequency of 4 Hz is

- None above
- -j56.5
- j94.2
- j75.4

Question 2 5 pts

The formula for the Q of a series-connected mechanical oscillator is always the same as for a parallel-connected mechanical oscillator.

- True
- False

Question 3 5 pts

At an air density of 1.2 kg per cubic meter, a 0.1 liter volume of air would correspond to a mechanical mass of

- 1.2 g
- None above
- 0.12 g
- 1.2 kg

Question 4 5 pts

A 0.1 m long piston of area 0.001 m^2 filled with gas having compressibility $\kappa = 10^{-5}$ Pa^{-1} is equivalent to a spring with compliance n=

- 10^{-3} m/N
- 0.1 m/M

Question 1 — 5 pts

An electric transmission line with 200 pF/m capacitance and 600 nH/m inductance has a phase velocity v_p=

- 126×10^6 m/s
- 105×10^6 m/s
- None above
- 91×10^6 m/s

Question 2 — 5 pts

An electric transmission line with 100 pF/m capacitance and 200 nH/m inductance has a characteristic impedance in ohms of Z_0=

- 51
- 45
- 63
- None above

Question 3 — 5 pts

A spring+mass mechanical transmission line with linear mass density m_R= 80 kg/m and compliance-per-meter of n_R=2 N has a characteristic impedance in N/(m/s) of Z_0=

- None above
- 4.47
- 9.11
- 6.32

Question 4 — 5 pts

A 0.6 m long spring with 4 N tension has a mass of 10 kg and has a zero-force length of 0.1 m. The group velocity in m/s of a pulse on this spring is

Question 1 — 5 pts

If a fluid has an acoustic phase velocity of v_p=100 m/s, then at a frequency of 10 Hz, the acoustic wavelength in meters is λ =

- 1000
- 1
- 10
- None above

Question 2 — 5 pts

At 277 ^{o}K, the density of carbon dioxide is 2 kg/m^{3} with γ = 1.3 at a pressure of 100 kPa. Under these conditions, the compressibility in Pa^{-1} is κ =

- None above
- 3.2 x 10^{-4}
- 1.31 x 10^{-6}
- 7.7 x 10^{-6}

Question 3 — 5 pts

Ethyl alcohol is a fluid with compressibility of κ =1.1 x 10^{-9} Pa^{-1} and a density of 790 kg/m^{3} at 300 ^{o}K and at a pressure of 100 kPa. Under these conditions, the acoustic group velocity in m/s of acoustic waves in a 2 cm diameter pipe filled with this fluid is v_g =

- 711
- 1073
- None above
- 853

Question 4 5 pts

The gradient of a pressure plane wave $p(x, y, z, t) = e^{-j2y} e^{j100t}$ equals $\begin{pmatrix} 0 \\ -j2e^{-j2y} e^{j100t} \\ 0 \end{pmatrix}$.

- True
- False