Chapter 16

Problems & Exercises

1.

(a) 1.23×10^3 N/m

(b) 6.88 kg

(c) 4.00 mm

3.

(a) 889 N/m

(b) 133 N

5.

(a) 6.53×10^3 N/m

(b) Yes

7.

16.7 ms

8.

0.400 s/beats

9.

400 Hz

10.

12,500 Hz

11.

1.50 kHz

12.

(a) 93.8 m/s

(b) 11.3×10^3 rev/min

13.

2.37 N/m

15.

0.389 kg

18.

94.7 kg

21.

1.94 s

22.

6.21 cm

24.

2.01 s

26.

2.23 Hz

28.

(a) 2.99541 s

(b) Since the period is related to the square root of the acceleration of gravity, when the acceleration changes by 1% the period changes by $(0.01)^2 = 0.01\%$ so it is necessary to have at least 4 digits after the decimal to see the changes.

30.

(a) Period increases by a factor of 1.41 ($\sqrt{2}$)

(b) Period decreases to 97.5% of old period

32.

Slow by a factor of 2.45

34.

length must increase by 0.0116%.

35.

(a) 1.99 Hz

(b) 50.2 cm

(c) 1.40 Hz, 71.0 cm

36.

(a) 3.95×10^6 N/m

(b) 7.90×10^6 J

37.

a). 0.266 m/s

b). 3.00 J

39.

$\pm\frac{\sqrt{3}}{2}$

42.

384 J

44.

(a). 0.123 m

(b). -0.600 J

(c). 0.300 J. The rest of the energy may go into heat caused by friction and other damping forces.

46.

(a) 5.00×10^5 J

(b) 1.20×10^3 s

47.

$t = 9.26$ d

49.

$f = 40.0$ Hz

51.

$v_{\text{w}} = 16.0$ m/s

53.

$\lambda = 700$ m

55.

$d = 34.0$ cm

57.

$f = 4$ Hz

59.

462 Hz,

4 Hz

61.

(a) 3.33 m/s

(b) 1.25 Hz

63.

0.225 W

65.

7.07

67.

16.0 d

68.

2.50 kW

70.

3.38×10^{-5} W/m^2