Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

SKU: 9780134780955-SOLUTIONS

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–1.

Round off the following numbers to three significant figures: (a) 3.45555 m, (b) 45.556 s, (c) 5555 N, (d) 4525 kg.

SOLUTION

(a) 3.46 m (b) 45.6 s (c) 5.56 kN (d) 4.52 Mg **Ans.**

Ans:
a) 3.46 m
b) 45.6 s
c) 5.56 kN
d) 4.52 Mg

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–2.

Represent each of the following combinations of units in the correct SI form using an appropriate prefix: (a) Mg/mm, (b) mN /μs, (c) μm · Mg.

SOLUTION

a) $\text{kN}/\mu\text{s} = 10^3\text{N}/(10^{-6})\,\text{s} = \text{GN/s}$ **Ans.**

b) $\text{Mg/mN} = 10^6\text{g}/10^{-3}\,\text{N} = \text{Gg/N}$ **Ans.**

c) $\text{MN}/(\text{kg}\cdot\text{ms}) = 10^6\,\text{N/kg}(10^{-3}\,\text{s}) = \text{GN}/(\text{kg}\cdot\text{s})$ **Ans.**

Ans:
a) GN/s
b) Gg/N
c) GN/(kg · s)

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–3.

Represent each of the following combinations of units in the correct SI form using an appropriate prefix: (a) Mg/mm, (b) mN/μs, (c) μm · Mg.

SOLUTION

a) $\text{Mg/mm} = \dfrac{10^3\,\text{kg}}{10^{-3}\text{m}} = \dfrac{10^6\,\text{kg}}{\text{m}} = \text{Gg/m}$ **Ans.**

b) $\text{mN}/\mu\text{s} = \dfrac{10^{-3}\,\text{N}}{10^{-6}\,\text{s}} = \dfrac{10^3\,\text{N}}{\text{s}} = \text{kN/s}$ **Ans.**

c) $\mu\text{m} \cdot \text{Mg} = \left[10^{-6}\,\text{m}\right] \cdot \left[10^3\,\text{kg}\right] = (10)^{-3}\,\text{m} \cdot \text{kg}$

$= \text{mm} \cdot \text{kg}$ **Ans.**

Ans:
a) Gg/m
b) kN/s
c) mm · kg

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

***1–4.**

What is the weight in newtons of an object that has a mass of (a) 8 kg, (b) 0.04 kg, and (c) 760 Mg?

SOLUTION

a) $W = 9.81(8) = 78.5\ \text{N}$ **Ans.**

b) $W = 9.81(0.04)\left(10^{-3}\right) = 3.92\left(10^{-4}\right)\ \text{N} = 0.392\ \text{mN}$ **Ans.**

c) $W = 9.81(760)\left(10^{3}\right) = 7.46\left(10^{6}\right)\ \text{N} = 7.46\ \text{MN}$ **Ans.**

Ans:
a) $W = 78.5$ N
b) $W = 0.392$ mN
c) $W = 7.46$ MN

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–5.

Represent each of the following as a number between 0.1 and 1000 using an appropriate prefix: (a) 45 320 kN, (b) $568(10^5)$ mm, and (c) 0.00563 mg.

SOLUTION

a) $45\,320\ \text{kN} = 45.3\ \text{MN}$ **Ans.**

b) $568(10^5)\ \text{mm} = 56.8\ \text{km}$ **Ans.**

c) $0.00563\ \text{mg} = 5.63\ \mu\text{g}$ **Ans.**

Ans:
a) 45.3 MN
b) 56.8 km
c) 5.63 μg

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–6.

Round off the following numbers to three significant figures: (a) 58 342 m, (b) 68.534 s, (c) 2553 N, and (d) 7555 kg.

SOLUTION

a) 58.3 km b) 68.5 s c) 2.55 kN d) 7.56 Mg **Ans.**

Ans:
a) 58.3 km
b) 68.5 s
c) 2.55 kN
d) 7.56 Mg

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–7.

Represent each of the following quantities in the correct SI form using an appropriate prefix: (a) 0.000 431 kg, (b) $35.3(10^3)$ N, and (c) 0.005 32 km.

SOLUTION

a) $0.000\,431\text{ kg} = 0.000\,431\left(10^3\right)\text{ g} = 0.431\text{ g}$ **Ans.**

b) $35.3\left(10^3\right)\text{ N} = 35.3\text{ kN}$ **Ans.**

c) $0.005\,32\text{ km} = 0.005\,32\left(10^3\right)\text{ m} = 5.32\text{ m}$ **Ans.**

Ans:
a) 0.431 g
b) 35.3 kN
c) 5.32 m

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

***1–8.**

Represent each of the following combinations of units in the correct SI form: (a) Mg/ms, (b) N/mm, and (c) mN/(kg · μs).

SOLUTION

a) $\frac{\text{Mg}}{\text{ms}} = \frac{10^3\ \text{kg}}{10^{-3}\ \text{s}} = 10^6\ \text{kg/s} = \text{Gg/s}$ **Ans.**

b) $\frac{\text{N}}{\text{mm}} = \frac{1\ \text{N}}{10^{-3}\ \text{m}} = 10^3\ \text{N/m} = \text{kN/m}$ **Ans.**

c) $\frac{\text{mN}}{(\text{kg} \cdot\ \mu\text{s})} = \frac{10^{-3}\ \text{N}}{10^{-6}\ \text{kg} \cdot \text{s}} = \text{kN/(kg} \cdot\ \text{s)}$ **Ans.**

Ans:
a) Gg/s
b) kN/m
c) kN/(kg · s)

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–9.

Represent each of the following combinations of units in the correct SI form using an appropriate prefix: (a) m/ms, (b) μkm, (c) ks/mg, and (d) km $\cdot$ μN.

SOLUTION

a) $\text{m/ms} = \left(\dfrac{\text{m}}{(10)^{-3}\,\text{s}}\right) = \left(\dfrac{(10)^{3}\,\text{m}}{\text{s}}\right) = \text{km/s}$ **Ans.**

b) $\mu\text{km} = (10)^{-6}(10)^{3}\,\text{m} = (10)^{-3}\,\text{m} = \text{mm}$ **Ans.**

c) $\text{ks/mg} = \left(\dfrac{(10)^{3}\,\text{s}}{(10)^{-6}\,\text{kg}}\right) = \left(\dfrac{(10)^{9}\,\text{s}}{\text{kg}}\right) = \text{Gs/kg}$ **Ans.**

d) $\text{km}\cdot\mu\text{N} = [(10)^{3}\,\text{m}][(10)^{-6}\,\text{N}] = (10)^{-3}\,\text{m}\cdot\text{N} = \text{mm}\cdot\text{N}$ **Ans.**

Ans:
a) km/s
b) mm
c) Gs/kg
d) mm $\cdot$ N

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–10.

Represent each of the following combinations of units in the correct SI form using an appropriate prefix: (a) $\mathrm{GN \cdot \mu m}$, (b) $\mathrm{kg/\mu m}$, (c) $\mathrm{N/ks^2}$, (d) $\mathrm{kN/\mu s}$

SOLUTION

a) $\mathrm{GN \cdot \mu m} = 10^9(10^{-6})\ \mathrm{N \cdot m} = \mathrm{kN \cdot m}$ **Ans.**

b) $\mathrm{kg/\mu m} = 10^3\ \mathrm{g}/10^{-6}\ \mathrm{m} = \mathrm{Gg/m}$ **Ans.**

c) $\mathrm{N/ks^2} = \mathrm{N}/10^6\ \mathrm{s^2} = 10^{-6}\ \mathrm{N/s^2} = \mu\mathrm{N/s^2}$ **Ans.**

d) $\mathrm{kN/\mu s} = 10^3\ \mathrm{N}/10^{-6}\ \mathrm{s} = 10^9\ \mathrm{N/s} = \mathrm{GN/s}$ **Ans.**

Ans:
a) $\mathrm{kN \cdot m}$
b) $\mathrm{Gg/m}$
c) $\mu\mathrm{N/s^2}$
d) $\mathrm{GN/s}$

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–11.

Represent each of the following combinations of units in the correct SI form using an appropriate prefix: (a) μMN, (b) N/μm, (c) MN/ks^2, and (d) kN/ms.

SOLUTION

a) $\mu\text{MN} = 10^{-6}(10^6)\,\text{N} = \text{N}$ **Ans.**

b) $\dfrac{\text{N}}{\mu\text{m}} = \dfrac{\text{N}}{10^{-6}\,\text{m}} = 10^6\,\text{N/m} = \text{MN/m}$ **Ans.**

c) $\dfrac{\text{MN}}{\text{ks}^2} = \dfrac{10^6\,\text{N}}{(10^3)^2\,\text{s}^2} = \text{N/s}^2$ **Ans.**

d) $\dfrac{\text{kN}}{\text{ms}} = \dfrac{10^3\,\text{N}}{10^{-3}\,\text{s}} = 10^6\,\dfrac{\text{N}}{\text{s}} = \text{MN/s}$ **Ans.**

Ans:
a) N
b) MN/m
c) N/s^2
d) MN/s

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

***1–12.**

Water has a density of $1.94\ \text{slug/ft}^3$. What is the density expressed in SI units? Express the answer to three significant figures.

SOLUTION

Using Table 1–2, we have

$$\rho_w = \left(\frac{1.94\ \text{slug}}{\text{ft}^3}\right)\left(\frac{14.5938\ \text{kg}}{1\ \text{slug}}\right)\left(\frac{1\ \text{ft}^3}{0.3048^3\ \text{m}^3}\right)$$

$$= 999.8\ \text{kg/m}^3 = 1.00\ \text{Mg/m}^3 \qquad \textbf{Ans.}$$

Ans:
$\rho_w = 1.00\ \text{Mg/m}^3$

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–13.

The density (mass/volume) of aluminum is $5.26\ \text{slug/ft}^3$. Determine its density in SI units. Use an appropriate prefix.

SOLUTION

$$5.26\ \text{slug/ft}^3 = \left(\frac{5.26\ \text{slug}}{\text{ft}^3}\right)\left(\frac{\text{ft}}{0.3048\ \text{m}}\right)^3\left(\frac{14.59\ \text{kg}}{1\ \text{slug}}\right)$$

$$= 2.71\ \text{Mg/m}^3 \qquad \textbf{Ans.}$$

Ans:
$2.71\ \text{Mg/m}^3$

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–14.

Evaluate each of the following to three significant figures and express each answer in SI units using an appropriate prefix: (a) $(212\ \text{mN})^2$, (b) $(52800\ \text{ms})^2$, and (c) $[548(10^6)]^{1/2}\ \text{ms}$.

SOLUTION

a) $(212\ \text{mN})^2 = \left[212(10)^{-3}\ \text{N}\right]^2 = 0.0449\ \text{N}^2 = 44.9(10)^{-3}\ \text{N}^2$ **Ans.**

b) $(52\,800\ \text{ms})^2 = \left[52\,800(10)^{-3}\right]^2\ \text{s}^2 = 2788\ \text{s}^2 = 2.79\left(10^3\right)\ \text{s}^2$ **Ans.**

c) $\left[548(10)^6\right]^{\frac{1}{2}}\ \text{ms} = (23\,409)(10)^{-3}\ \text{s} = 23.4(10)^3(10)^{-3}\ \text{s} = 23.4\ \text{s}$ **Ans.**

Ans:
a) $44.9(10)^{-3}\ \text{N}^2$
b) $2.79\left(10^3\right)\ \text{s}^2$
c) 23.4 s

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–15.

Using the SI system of units, show that Eq. 1–2 is a dimensionally homogeneous equation which gives F in newtons. Determine to three significant figures the gravitational force acting between two spheres that are touching each other. The mass of each sphere is 200 kg and the radius is 300 mm.

SOLUTION

Using Eq. 1–2,

$$F = G\frac{m_1 m_2}{r^2}$$

$$\mathrm{N} = \left(\frac{\mathrm{m}^3}{\mathrm{kg}\cdot\mathrm{s}^2}\right)\left(\frac{\mathrm{kg}\cdot\mathrm{kg}}{\mathrm{m}^2}\right) = \frac{\mathrm{kg}\cdot\mathrm{m}}{\mathrm{s}^2} \qquad \textit{(Q.E.D.)}$$

$$F = G\frac{m_1 m_2}{r^2}$$

$$= 66.73\left(10^{-12}\right)\left[\frac{200(200)}{0.6^2}\right]$$

$$= 7.41\left(10^{-6}\right)\mathrm{N} = 7.41\ \mu\mathrm{N} \qquad \textbf{Ans.}$$

Ans:
7.41 μN

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

***1–16.**

Evaluate each of the following to three significant figures and express each answer in SI units using an appropriate prefix: (a) $(200\ \text{kN})^2$, (b) $(0.005\ \text{mm})^2$, and (c) $(400\ \text{m})^3$.

SOLUTION

a) $(200\ \text{kN})^2 = 40\,000\left(10^6\right)\ \text{N}^2 = 0.04\left(10^{12}\right)\ \text{N}^2 = 0.04\ \text{MN}^2$ **Ans.**

b) $(0.005\ \text{mm})^2 = 25\left(10^{-12}\right)\ \text{m}^2 = 25\mu\text{m}^2$ **Ans.**

c) $(400\ \text{m})^3 = 0.064\left(10^9\right)\ \text{m}^3 = 0.064\ \text{km}^3$ **Ans.**

Ans:
a) $0.04\ \text{MN}^2$
b) $25\mu\text{m}^2$
c) $0.064\ \text{km}^3$

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–17.

If a car is traveling at 55 mi/h, determine its speed in kilometers per hour and meters per second.

SOLUTION

$$55\ \text{mi/h} = \left(\frac{55\ \text{mi}}{1\ \text{h}}\right)\left(\frac{5280\ \text{ft}}{1\ \text{mi}}\right)\left(\frac{0.3048\ \text{m}}{1\ \text{ft}}\right)\left(\frac{1\ \text{km}}{1000\ \text{m}}\right)$$

$$= 88.5\ \text{km/h} \qquad \textbf{Ans.}$$

$$88.5\ \text{km/h} = \left(\frac{88.5\ \text{km}}{1\ \text{h}}\right)\left(\frac{1000\ \text{m}}{1\ \text{km}}\right)\left(\frac{1\ \text{h}}{3600\ \text{s}}\right) = 24.6\ \text{m/s} \qquad \textbf{Ans.}$$

Ans:
88.5 km/h
24.6 m/s

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–18.

Evaluate (204 mm)(0.00457 kg)/(34.6 N) to three significant figures and express the answer in SI units using an appropriate prefix.

SOLUTION

$$(204\text{ mm})(0.004\,57\text{ kg})/(34.6\text{ N}) = \left(\frac{\left[204\left(10^{-3}\right)\text{ m}\right]\left[4.57\left(10^{-3}\right)\text{ kg}\right]}{34.6\text{ N}}\right)$$

$$= \left(\frac{26.9\left(10^{-6}\right)\text{ m}\cdot\text{ kg}}{1\text{ N}}\right)$$

$$= 26.9\ \mu\text{m}\cdot\text{ kg/N} \qquad \textbf{Ans.}$$

Ans:
$26.9\ \mu\text{m}\cdot\text{kg/N}$

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–19.

The specific weight (wt./vol.) of brass is $520\ \text{lb/ft}^3$. Determine its density (mass/vol.) in SI units. Use an appropriate prefix.

SOLUTION

$$520\ \text{lb/ft}^3 = \left(\frac{520\ \text{lb}}{\text{ft}^3}\right)\left(\frac{1\ \text{ft}}{0.3048\ \text{m}}\right)^3\left(\frac{4.448\ \text{N}}{1\ \text{lb}}\right)\left(\frac{1\ \text{kg}}{9.81\ \text{N}}\right)$$

$$= 8.33\ \text{Mg/m}^3 \qquad \textbf{Ans.}$$

Ans:
$8.33\ \text{Mg/m}^3$

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

***1–20.**

If a man weighs 155 lb on earth, specify (a) his mass in slugs, (b) his mass in kilograms, and (c) his weight in newtons. If the man is on the moon, where the acceleration due to gravity is $g_m = 5.30\ \text{ft/s}^2$, determine (d) his weight in pounds, and (e) his mass in kilograms.

SOLUTION

a) $m = \dfrac{155}{32.2} = 4.81\ \text{slug}$ **Ans.**

b) $m = 155\left[\dfrac{14.59\ \text{kg}}{32.2}\right] = 70.2\ \text{kg}$ **Ans.**

c) $W = 155(4.4482) = 689\ \text{N}$ **Ans.**

d) $W = 155\left[\dfrac{5.30}{32.2}\right] = 25.5\ \text{lb}$ **Ans.**

e) $m = 155\left[\dfrac{14.59\ \text{kg}}{32.2}\right] = 70.2\ \text{kg}$ **Ans.**

Also,

$m = 25.5\left[\dfrac{14.59\ \text{kg}}{5.30}\right] = 70.2\ \text{kg}$ **Ans.**

Ans:
a) 4.81 slug
b) 70.2 kg
c) 689 N
d) 25.5 lb
e) 70.2 kg

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual

© 2022 by R. C. Hibbeler. Published by Pearson Education, Inc., Hoboken, NJ. All rights reserved. This material is protected under all copyright laws as they currently exist. No portion of this material may be reproduced, in any form or by any means, without permission in writing from the publisher.

1–21.

Two particles have a mass of 8 kg and 12 kg, respectively. If they are 800 mm apart, determine the force of gravity acting between them. Compare this result with the weight of each particle.

SOLUTION

$$F = G\frac{m_1 m_2}{r^2}$$

Where $G = 66.73\left(10^{-12}\right)\ \text{m}^3/(\text{kg}\cdot\text{s}^2)$

$$F = 66.73\left(10^{-12}\right)\left[\frac{8(12)}{(0.8)^2}\right] = 10.0\left(10^{-9}\right)\text{N} = 10.0\ \text{nN}$$ **Ans.**

$$W_1 = 8(9.81) = 78.5\ \text{N}$$ **Ans.**

$$W_2 = 12(9.81) = 118\ \text{N}$$ **Ans.**

Ans:
$F = 10.0$ nN
$W_1 = 78.5$ N
$W_2 = 118$ N

Engineering Mechanics Statics and Dynamics 15th edition Hibbeler Solutions Manual