ERRATA for
PE Agricultural and Biological Engineering Practice Exam

ISBN: 978-1-947801-24-0

Errata posted 8/10/2022

Revisions are shown in red.

Question 37, p. 32
The options should read as follows:

- ○ A. $C_u = 4$
  $C_c = 0.5$
- ○ B. $C_u = 4$
  $C_c = 1.1$
- ○ C. $C_u = 5.5$
  $C_c = 0.5$
- ○ D. $C_u = 5.5$
  $C_c = 1.1$

Question 49, p. 38
The options should read as follows:

- ○ A. 2
- ○ B. 7
- ○ C. 9
- ○ D. 36

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Question 53, p. 42

The question should read as follows:

A tubular-bowl centrifuge can be used to separate particles by diameter from a liquid feed stream containing particles of various diameters.

Assume the following relationship for particle cut-point diameter as a function of various parameters holds:

$$D_P = \sqrt{\frac{18 q\mu \left[\ln\left(\frac{r_2}{r_1}\right)\right]}{\omega^2 \pi b \left(\rho_P - \rho\right)\left(r_2^{\,2} - r_1^{\,2}\right)}}$$

where:

D_P = particle cut-point diameter
q = volumetric flow rate of fluid
μ = fluid viscosity
r_1 = radius at time 0
r_2 = radius at time t_T
ω = rotational velocity of bowl
b = bowl length
ρ_P = particle density
ρ = fluid density

Match the change in particle cut-point diameter with each of the given changes in a separation parameter.

Separation Parameter Change		Particle Cut-Point Diameter Change
Fluid density increases		Increases
Particle density increases		Decreases
Atmospheric pressure decreases		Remains the same
Volumetric flow rate increases		

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Question 56, p. 43
The question should read as follows:

An 80-ft-wide × 200-ft-long greenhouse with a semicircular (hoop or arch) cross section has a double-polyethylene (IR-inhibited) covering on the top, side, and ends. It also has a heating system with an output of 400,000 Btu/hr. For the double-polyethylene covering, $R = 2.0$ hr-ft^2-°F/Btu. The temperature difference that can be maintained inside to outside in the greenhouse is most nearly:

Question 69, p. 50
The options should read as follows:

- ○ A. more than 40
- ○ B. between 21 and 40
- ○ C. between 13 and 20
- ○ D. less than 12

Solution Table, p. 62
The solution for 69 is D.

Solution 37, p. 78
The following was added to the solution:

From the graph, $D_{10} = 1.3$, $D_{30} = 3.1$, $D_{60} = 7.0$

$$C_u = \frac{D_{60}}{D_{10}} = \frac{7.0}{1.3} = 5.4$$

$$C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = \frac{(3.1)^2}{7.0 \times 1.3} = 1.06$$

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Solution 49, p. 86

The solution should read as follows:

Reference: General practice knowledge

ΔT = 30°C or 30 K

$Q = UA\Delta T$

Q = 2,114 kJ/kg × 1,000 kg/hr

$$Q = 2.11\times 10^6\ \frac{\text{kJ}}{\text{hr}}\times\frac{\text{W}\bullet\text{sec}}{\text{J}}\times\frac{\text{hr}}{3{,}600\ \text{sec}} = 586\ \text{kW}$$

Q = 2,700 W/m^2•K × 30 K × A

$$586\ \text{kW} = 2{,}700\ \frac{\text{W}}{\text{m}^2\bullet\text{K}}\times 30\ \text{K}\times A$$

$$A = \frac{586\ \text{kW}\bullet\text{m}^2\bullet\text{K}}{2.7\ \text{kW}\times 30\ \text{K}}$$

$$A = 7.23\ \text{m}^2$$

THE CORRECT ANSWER IS: B

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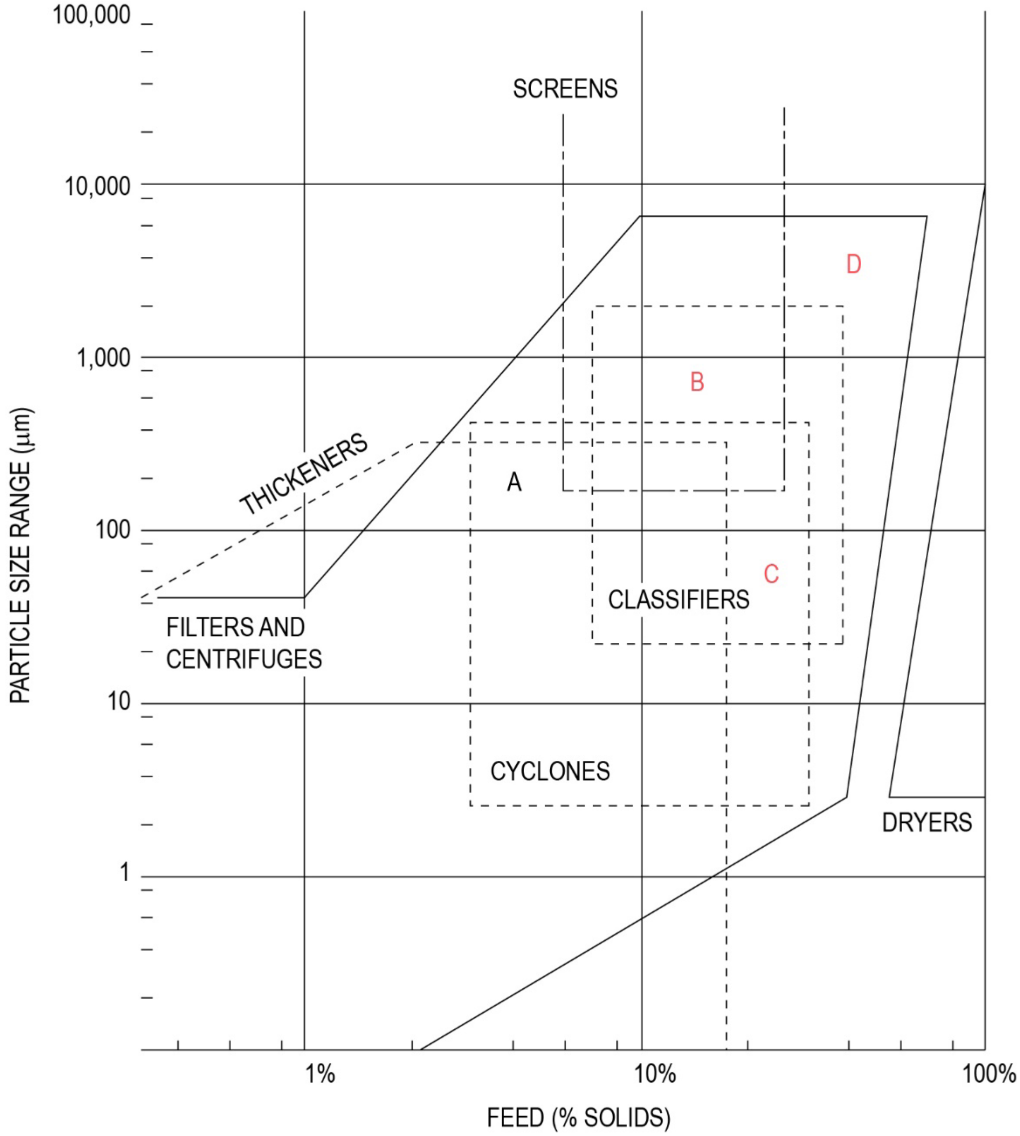
Solution 52, p. 88

The figure in the solution was modified as shown below:



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Solution 53, p. 89
The solution should read as follows:

Changes in parameters present in the numerator (e.g., volumetric flow rate) result in proportional changes in particle cut-point diameter. Changes in parameters present in the denominator (e.g., density difference, which is a function of particle density and fluid density) result in inversely proportional changes in particle cut-point diameter. Changes in parameters absent from the equation (e.g., atmospheric pressure) have no influence on particle cut-point diameter.

Separation Parameter Change	
Fluid density increases	Increases
Particle density increases	Decreases
Atmospheric pressure decreases	Remains the same
Volumetric flow rate increases	Increases

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Solution 56, p. 93

The following was added to the solution under “Rearranging”:

Rearranging:

$$\Delta T = (T_o - T_i) = \frac{q}{UA}$$

$$q = 400{,}000 \frac{\text{Btu}}{\text{hr}}$$

$$A = \text{area of ends} + \text{area of top} = 2 \times \frac{\pi r^2}{2} + \frac{\pi DL}{2}$$

$$= 3.14 \times (40\ \text{ft})^2 + \frac{3.14 \times 80\ \text{ft} \times 200\ \text{ft}}{2} = 5{,}024\ \text{ft}^2 + 25{,}120\ \text{ft}^2 = 30{,}144\ \text{ft}^2$$

$$U = \frac{1}{R}$$

$$U = \frac{1}{2.0} = 0.50$$

$$U = 0.50 \frac{\text{Btu}}{\text{hr-ft}^2\text{-°F}}$$

$$\Delta T = \frac{400{,}000 \frac{\text{Btu}}{\text{hr}}}{0.50 \frac{\text{Btu}}{\text{hr-ft}^2\text{-°F}} \times 30{,}144\ \text{ft}^2} = 26.5\text{°F}$$

Solution 65, p. 95

The variable v in the last section of the solution was changed to the following:

$q_v = Mv$

$v = 0.835$ m^3/kg at 18°C and 60% (from psychrometric chart)

$q_v = 1.3$ kg/s × 0.83 m^3/kg × 60 s/min = 66 m^3/min

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Solution 69, p. 97

The solution should read as follows:

Reference: *ASCE Minimum Design Loads for Buildings and Other Structures*

Assumptions:

Slippery roof
Risk Category I
Heated
Exposure C

$p_s = C_s p_f$

$p_f = 0.7 C_e C_t I_s p_g$

C_e, exposure factor Category C that is fully exposed = 0.9 (from Table 7-2)
C_t, thermal factor for heated structure = 1.0 (from Table 7-3)
I_s, importance factor for agricultural building with low occupancy = 0.8 (from Table 1.5-2)
C_s, warm roof slope factor = 1.0 (from Figure 7-2a)

$p_f = (0.7)(0.9)(1.0)(0.8)(20) = 10.08$ psf
$p_s = (1.0)10.08$ psf $= 10.08$ psf

THE CORRECT ANSWER IS: D

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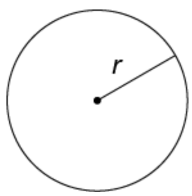
Solution 85, p. 111
The options should read as follows:

Reference: General practice knowledge

r = 1,800 mm
circumference = $\pi 2r$ = 11,309 mm

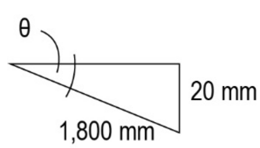


$$\frac{\pm 20 \text{ mm}}{11{,}309} \times 360° = \pm 0.63° \text{ total target zone}$$

Need to have sensor ± 0.63°

From the options, the minimum resolution that will satisfy the requirements of minimum position accuracy is ± 0.5°.

Alternatively:



$$\theta = \sin^{-1}\left(\frac{20 \text{ mm}}{1{,}800 \text{ mm}}\right) \rightarrow \theta = 0.63°$$