

# 연습문제 답안

## 제1장

### ■ 연습문제 1

- |             |             |          |
|-------------|-------------|----------|
| 1. 19kg     | 2. 479mm    | 3. -66   |
| 4. 565원     | 5. -225     | 6. -2136 |
| 7. 107,701원 | 8. -4       | 9. 1487  |
| 10. -70872  | 11. \$15333 |          |

### ■ 연습문제 2

- |                         |                        |
|-------------------------|------------------------|
| 1. (a) 468 (b) 868      | 2. (a) 1827원 (b) 4158원 |
| 3. (a) 8613kg (b) 584kg | 4. (a) 351mm (b) 924mm |
| 5. (a) 48m (b) 89m      | 6. (a) 259 (b) 56      |
| 7. (a) 8067 (b) 3347    | 8. 18kg                |
| 9. 90cm                 | 10. 29                 |

### ■ 연습문제 3

- |                   |                    |
|-------------------|--------------------|
| 1. (a) 4 (b) 24   | 2. (a) 12 (b) 360  |
| 3. (a) 10 (b) 350 | 4. (a) 90 (b) 2700 |
| 5. (a) 2 (b) 210  | 6. (a) 3 (b) 180   |
| 7. (a) 5 (b) 210  | 8. (a) 15 (b) 6300 |

### ■ 연습문제 4

- |       |       |       |      |       |       |
|-------|-------|-------|------|-------|-------|
| 1. 59 | 2. 14 | 3. 88 | 4. 5 | 5. 33 | 6. 22 |
| 7. 68 | 8. 5  |       |      |       |       |

## 제2장

### ■ 연습문제 5

- |                      |                     |                     |  |
|----------------------|---------------------|---------------------|--|
| 1. $2\frac{1}{7}$    | 2. $\frac{22}{9}$   | 3. $\frac{4}{11}$   | 4. $\frac{3}{7}, \frac{4}{9}, \frac{1}{2}, \frac{3}{5}, \frac{5}{8}$ |
| 5. $\frac{11}{15}$   | 6. $\frac{17}{30}$  | 7. $\frac{9}{10}$   | 8. $\frac{3}{16}$  |
| 9. $\frac{43}{77}$   | 10. $\frac{47}{63}$ | 11. $1\frac{1}{15}$ | 12. $\frac{4}{27}$   |
| 13. $8\frac{51}{52}$ | 14. $1\frac{9}{40}$ |                     |  |

### ■ 연습문제 6

- |                   |                   |                   |                   |                    |
|-------------------|-------------------|-------------------|-------------------|--------------------|
| 1. $\frac{8}{35}$ | 2. $\frac{6}{11}$ | 3. $\frac{5}{12}$ | 4. $\frac{3}{28}$ | 5. $\frac{3}{5}$   |
| 6. $\frac{1}{13}$ | 7. $1\frac{1}{2}$ | 8. $\frac{8}{15}$ | 9. $2\frac{2}{5}$ | 10. $3\frac{3}{4}$ |

11.  $\frac{12}{23}$       12.  $-\frac{3}{4}$       13.  $\frac{1}{9}$       14. 13      15. 400리터  
16. 2880리터

■ 연습문제 7

1.  $2\frac{1}{18}$       2.  $-\frac{1}{9}$       3.  $1\frac{1}{6}$       4.  $4\frac{3}{4}$       5.  $\frac{13}{20}$   
6.  $\frac{7}{15}$       7.  $4\frac{19}{20}$       8. 2

■ 연습문제 8

1. 36:1      2. 3.5:1 또는 7:2      3. 47:3      4. 96cm, 240cm  
5.  $5\frac{1}{4}$ 시간 또는 5시간 15분      6. 3680만 원, 1840만 원, 920만 원  
7. 12cm      8. 8960 볼트

■ 연습문제 9

1. 14.18      2. 2.785      3. 65.38      4. 43.27  
5. 1.297      6. 0.000528

■ 연습문제 10

1. 80.3      2. 329.3      3. 72.54      4. -124.83  
5. 295.3

■ 연습문제 11

1. 4.998      2. 47.544      3. 456.9      4. 434.82  
5. 626.1      6. 0.444      7. 0.62963      8. 1.563  
9. 13.84      10. (a) 24.81 (b) 24.812  
11. (a) 0.00639 (b) 0.0064      12. (a)  $8.\dot{4}$  (b)  $62.\dot{6}$

■ 연습문제 12

1. 0.32%      2. 173.4%      3. 5.7%      4. 0.20  
5. 0.0125      6. 68.75%      7. (a) 21.2% (b) 79.2% (c) 169%  
8. (a) 57.1 (b) 52.9 (c) 55.6      9.  $\frac{5}{16}$       10.  $\frac{9}{16}$   
11. 21.8kg      12. 9.72m      13. (a) 496.4t (b) 8.657g (c) 20.73s  
14. (a) 14% (b) 15.67% (c) 5.36%      15. 37.49%      16. 17%  
17. 38.7%      18. 2.7%      19. 2.5%      20. 779Ω에서 861Ω까지  
21. (a) (i) 544Ω (ii) 816Ω (b) (i) 44.65kΩ (ii) 49.35kΩ  
22. 2592rev/min

13

- |        |        |            |       |            |
|--------|--------|------------|-------|------------|
| 1. 27  | 2. 128 | 3. 100 000 | 4. 96 | 5. $\pm 5$ |
| 6. 100 | 7. 1   | 8. 64      |       |            |

## ■ 연습문제 14

- |                                |                          |                  |  |                   |
|--------------------------------|--------------------------|------------------|--|-------------------|
| 1. 128                         | 2. $3^9$                 | 3. 16            | 4. $\frac{1}{9}$                                   | 5. 1              |
| 6. 8                           | 7. 100                   | 8. 1000          | 9. $\frac{1}{100}$ 또는 0.01                         |                   |
| 10. 5                          | 11. $7^6$                | 12. $3^6$ 또는 729 | 13. $3^{-5}$ 또는 $\frac{1}{3^5}$ 또는 $\frac{1}{243}$ |                   |
| 14. 49                         | 15. $\frac{1}{2}$ 또는 0.5 | 16. 1            | 17. $\frac{1}{3 \times 5^2}$                       |                   |
| 18. $\frac{1}{7^3 \times 3^7}$ | 19. $\frac{3^2}{2^5}$    | 20. 9            | 21. 3  | 22. $\frac{2}{3}$ |

## ■ 연습문제 15

- |                                 |                                |
|---------------------------------|--------------------------------|
| 1. 세제곱미터, $\text{m}^3$          | 2. 패럿                          |
| 3. 제곱미터, $\text{m}^2$           | 4. 초당 미터, $\text{m/s}$         |
| 5. 세제곱미터당 킬로그램, $\text{kg/m}^3$ | 6. 주울                          |
| 7. 쿨롱                           | 8. 와트                          |
| 9. 볼트                           | 10. 질량                         |
| 11. 전기저항                        | 12. 주파수                        |
| 13. 가속도                         | 14. 전기 전류                      |
| 15. 인덕턴스                        | 16. 길이                         |
| 17. 온도                          | 18. 각속도                        |
| 19. $\times 10^9$               | 20. $\text{m}, \times 10^{-3}$ |
| 21. $\times 10^{-12}$           | 22. $\text{M}, \times 10^6$    |

## ■ 연습문제 16

- (a)  $7.39 \times 10$  (b)  $2.84 \times 10$  (c)  $1.9762 \times 10^2$
- (a)  $2.748 \times 10^3$  (b)  $3.317 \times 10^4$  (c)  $2.74218 \times 10^5$
- (a)  $2.401 \times 10^{-1}$  (b)  $1.74 \times 10^{-2}$  (c)  $9.23 \times 10^{-3}$
- (a)  $1.7023 \times 10^3$  (b)  $1.004 \times 10$  (c)  $1.09 \times 10^{-2}$
- (a)  $5 \times 10^{-1}$  (b)  $1.1875 \times 10$  (c)  $3.125 \times 10^{-2}$  (d)  $1.306 \times 10^2$
- (a) 1010 (b) 932.7 (c) 54100 (d) 7
- (a) 0.0389 (b) 0.6741 (c) 0.008
- (a)  $1.35 \times 10^2$  (b)  $1.1 \times 10^5$
- (a)  $2 \times 10^2$  (b)  $1.5 \times 10^{-3}$
- (a)  $2.71 \times 10^3 \text{ kg m}^{-3}$  (b)  $4.4 \times 10^{-1}$  (c)  $3.7673 \times 10^2 \Omega$  (d)  $5.11 \times 10^{-1} \text{ MeV}$   
(e)  $9.57897 \times 10^7 \text{ C kg}^{-1}$  (f)  $2.241 \times 10^{-2} \text{ m}^3 \text{ mol}^{-1}$

## ■ 연습문제 17

- |                          |                    |                                     |
|--------------------------|--------------------|-------------------------------------|
| 1. 60kPa                 | 2. 150μW 또는 0.15mW | 3. 50MV                             |
| 4. 55nF                  | 5. 100kW           | 6. 0.54mA 또는 540μA                  |
| 7. 1.5MΩ                 | 8. 22.5mV          | 9. 35GHz                            |
| 11. 17μA                 | 12. 46.2kΩ         | 13. 3μA                             |
| 15. 62.50m               | 16. 0.0346kg       | 17. $13.5 \times 10^{-3}$           |
| 19. $3.8 \times 10^5$ km | 20. 0.053nm        | 21. 5.6MPa                          |
|                          |                    | 22. $4.3 \times 10^{-3}$ m 또는 4.3mm |
|                          |                    | 14. 2.025MHz                        |
|                          |                    | 18. $4 \times 10^3$                 |

## 제4장

### ■ 연습문제 18

- |                           |                             |                        |                          |
|---------------------------|-----------------------------|------------------------|--------------------------|
| 1. 53.832                 | 2. 1.0944                   | 3. 50.330              | 4. 12.25                 |
| 5. $1.296 \times 10^{-3}$ | 6. 2.4430                   | 7. 30.96               | 8. 0.0549                |
| 9. 0.571                  | 10. 40                      | 11. 137.9              | 12. 14.96                |
| 13. 19.4481               | 14. $515.36 \times 10^{-6}$ | 15. 1.0871             | 16. 52.70                |
| 17. 11.122                | 18. 0.8307                  | 19. 2.571              | 20. 1.256                |
| 21. 1.068                 | 22. $3.5 \times 10^6$       | 23. $37.5 \times 10^3$ | 24. $4.2 \times 10^{-6}$ |
| 25. $18.32 \times 10^6$   |                             |                        |                          |

### ■ 연습문제 19

- |                    |            |                   |                   |
|--------------------|------------|-------------------|-------------------|
| 1. $\frac{13}{14}$ | 2. 4.458   | 3. $\frac{1}{21}$ | 4. $3\frac{1}{3}$ |
| 5. 0.0776          | 6. 0.2719  | 7. 0.4424         | 8. 0.0321         |
| 9. 0.4232          | 10. 0.1502 | 11. -0.6992       | 12. 5.8452        |
| 13. 4.995          | 14. 25.72  | 15. 591.0         | 16. 17.90         |
| 17. 3.520          | 18. 0.3770 |                   |                   |

### ■ 연습문제 20

- |                          |                           |                           |                              |
|--------------------------|---------------------------|---------------------------|------------------------------|
| 1. $C = 52.78$ mm        | 2. $R = 37.5$             | 3. 159m/s                 | 4. 5.02mm                    |
| 5. 0.144J                | 6. 224.5                  | 7. $14230 \text{ kg/m}^3$ | 8. 281.1m/s                  |
| 9. $2.526 \Omega$        | 10. 508.1W                | 11. $V = 2.61 \text{ V}$  | 12. $F = 854.5$              |
| 13. $E = 3.96 \text{ J}$ | 14. $I = 12.77 \text{ A}$ | 15. $s = 17.25 \text{ m}$ | 16. $A = 7.184 \text{ cm}^2$ |

## 제5장

### ■ 연습문제 21

- |                  |                    |                        |                    |
|------------------|--------------------|------------------------|--------------------|
| 1. $-3a$         | 2. $a + 2b + 4c$   | 3. $6ab - 3a$          | 4. $6x - 5y + 8z$  |
| 5. $4x + 2y + 2$ | 6. $3a + 5b$       | 7. $-2a - b + 2c$      | 8. $p^2q^3r$       |
| 9. $8a^2$        | 10. $6q^2$         | 11. 46                 | 12. $-\frac{1}{2}$ |
| 13. 6            | 14. $\frac{1}{7y}$ | 15. $3a^2 + 2ab - b^2$ | 16. $\frac{1}{3b}$ |

### ■ 연습문제 22

- |   |                                     |              |                                |
|---|-------------------------------------|--------------|--------------------------------|
| 1. $z^8$  | 2. $a^8$                            | 3. $n^3$     | 4. $b^{11}$                    |
| 5. $b^{-3}$   | 6. $c^4$                            | 7. $m^4$     | 8. $x^{-3}$ 또는 $\frac{1}{x^3}$ |
| 9. $x^{12}$   | 10. $y^{-6}$ 또는 $\frac{1}{y^6}$     | 11. $t^8$    | 12. $c^{14}$                   |
| 13. $a^{-9}$ 또는 $\frac{1}{a^9}$   | 14. $b^{-12}$ 또는 $\frac{1}{b^{12}}$ | 15. $b^{10}$ | 16. $s^{-9}$                   |
| 17. $a^3b^{-2}c$ 또는 $\frac{a^3c}{b^2}$ , 9  | 18. $a^{-4}b^5c^{11}$               |              |                                |
| 19. $a^{11/6}b^{1/3}c^{-3/2}$ 또는 $\frac{\sqrt[6]{a^{11}}\sqrt[3]{b}}{\sqrt{c^3}}$ |                                     |              |                                |

### ■ 연습문제 23

- |                     |                      |                 |                  |
|---------------------|----------------------|-----------------|------------------|
| 1. $x^2+5x+6$       | 2. $2x^2+9x+4$       | 3. $4x^2+12x+9$ | 4. $2j^2+2j-12$  |
| 5. $4x^2+22x+30$    | 6. $2pqr+p^2q^2+r^2$ | 7. $x^2+12x+36$ | 8. $25x^2+30x+9$ |
| 9. $4x^2-24x+36$    | 10. $4x^2-9$         | 11. $3ab-6a^2$  | 12. $2x^2-2xy$   |
| 13. $2a^2-3ab-5b^2$ | 14. $13p-7q$         | 15. $7x-y-4z$   | 16. $4a^2-25b^2$ |
| 17. $x^2-4xy+4y^2$  | 18. 0                | 19. $4-a$       | 20. $4ab-8a^2$   |

### ■ 연습문제 24

- |                           |                  |                      |               |
|---------------------------|------------------|----------------------|---------------|
| 1. $2(x+2)$               | 2. $2x(y-4z)$    | 3. $p(b+2c)$         | 4. $2x(1+2y)$ |
| 5. $4d(d-3f^5)$           | 6. $4x(1+2x)$    | 7. $2q(q+4n)$        | 8. $r(s+p+t)$ |
| 9. $x(1+3x+5x^2)$         | 10. $bc(a+b^2)$  | 11. $3xy(xy^3-5y+6)$ |               |
| 12. $2pq^2(2p^2-5q)$      | 13. $7ab(3ab-4)$ | 14. $2xy(y+3x+4x^2)$ |               |
| 15. $2xy(x-2y^2+4x^2y^3)$ |                  |                      |               |

### ■ 연습문제 25

- |                          |               |                           |                          |
|--------------------------|---------------|---------------------------|--------------------------|
| 1. $2x+8x^2$             | 2. $12y^2-3y$ | 3. $4b-15b^2$             | 4. $4+3a$                |
| 5. $\frac{3}{2}-4x$      | 6. 1          | 7. $10y^2-3y+\frac{1}{4}$ | 8. $9x^2+\frac{1}{3}-4x$ |
| 9. $6a^2+5a-\frac{1}{7}$ | 10. $-15t$    |                           |                          |

## 제6장

### ■ 연습문제 26

- |                  |         |       |       |         |       |
|------------------|---------|-------|-------|---------|-------|
| 1. 1             | 2. 2    | 3. 6  | 4. -4 | 5. 2    | 6. 2  |
| 7. $\frac{1}{2}$ | 8. 0    | 9. 3  | 10. 2 | 11. -10 | 12. 6 |
| 13. -2           | 14. 2.5 | 15. 2 |       |         |       |

### ■ 연습문제 27

- |                    |       |                    |              |        |       |
|--------------------|-------|--------------------|--------------|--------|-------|
| 1. 5               | 2. -2 | 3. $-4\frac{1}{2}$ | 4. 2         | 5. 15  | 6. -4 |
| 7. $5\frac{1}{3}$  | 8. 2  | 9. 13              | 10. -11      | 11. -6 | 12. 9 |
| 13. $6\frac{1}{4}$ | 14. 3 | 15. 10             | 16. $\pm 12$ |        |       |

### ■ 연습문제 28

- |                |                    |          |                                   |
|----------------|--------------------|----------|-----------------------------------|
| 1. $10^{-7}$   | 2. $8\text{m/s}^2$ | 3. 3.472 | 4. (a) $1.8\Omega$ (b) $30\Omega$ |
| 5. $800\Omega$ | 6. $176\text{MPa}$ |          |                                   |

### ■ 연습문제 29

- |            |                  |                       |       |
|------------|------------------|-----------------------|-------|
| 1. 0.004   | 2. 30            | 3. $45^\circ\text{C}$ | 4. 50 |
| 5. 12m, 8m | 6. $3.5\text{N}$ |                       |       |

## 제7장

### ■ 연습문제 30

- |                             |                         |                          |                               |
|-----------------------------|-------------------------|--------------------------|-------------------------------|
| 1. $d = c - e - a - b$      | 2. $x = \frac{y}{7}$    | 3. $v = \frac{c}{p}$     | 4. $a = \frac{v - u}{t}$      |
| 5. $y = \frac{1}{3}(t - x)$ | 6. $r = \frac{c}{2\pi}$ | 7. $x = \frac{y - c}{m}$ | 8. $T = \frac{I}{PR}$         |
| 9. $L = \frac{XL}{2\pi f}$  | 10. $R = \frac{E}{I}$   | 11. $x = a(y - 3)$       | 12. $C = \frac{5}{9}(F - 32)$ |

### ■ 연습문제 31

- |  |   |
|--|---|
| 1. $r = \frac{S - a}{S}$ 또는 $1 - \frac{a}{S}$              | 2. $x = \frac{d}{\lambda}(y + \lambda)$ 또는 $d + \frac{yd}{\lambda}$ |
| 3. $f = \frac{3F - AL}{3}$ 또는 $f = F - \frac{AL}{3}$       | 4. $D = \frac{AB^2}{5Cy}$   |
| 5. $t = \frac{R - R_0}{R_0\alpha}$                         | 6. $R_2 = \frac{RR_1}{R_1 - R}$                                     |
| 7. $R = \frac{E - e - Ir}{I}$ 또는 $R = \frac{E - e}{I} - r$ | 8. $b = \sqrt{\left(\frac{y}{4ac^2}\right)}$                        |
| 9. $x = \frac{ay}{\sqrt{(y^2 - b^2)}}$                     | 10. $L = \frac{gt^2}{4\pi^2}$                                       |

$$11. u = \sqrt{v^2 - 2as}$$

$$13. v = \sqrt{\frac{2L}{\rho ac}}$$

$$12. a = N^2 y - x$$

### ■ 연습문제 32

$$1. a = \sqrt{\left(\frac{xy}{m-n}\right)}$$

$$3. r = \frac{3(x+y)}{(1-x-y)}$$

$$5. b = \frac{c}{\sqrt{1-a^2}}$$

$$7. v = \frac{uf}{u-f}, 30$$

$$9. v = \sqrt{\left(\frac{2dgh}{0.03L}\right)}, 0.965$$

$$11. 64 \text{ mm}$$

$$13. t_2 = t_1 - \frac{Qd}{kA}$$

$$15. F = EI \left( \frac{n\pi}{L} \right)^2; 13.61 \text{ MN}$$

$$2. R = \sqrt[4]{\left(\frac{M}{\pi} + r^4\right)}$$

$$4. L = \frac{mrCR}{\mu - m}$$

$$6. r = \sqrt{\left(\frac{x-y}{x+y}\right)}$$

$$8. t_2 = t_1 + \frac{Q}{mc}, 55$$

$$10. l = \frac{8S^2}{3d} + d, 2.725$$

$$12. w = \frac{2R-F}{L}; 3 \text{ kN/m}$$

$$14. r = \frac{v}{\omega} \left( \frac{1-s}{100} \right)$$

$$16. r = \sqrt[4]{\left(\frac{8\eta\ell V}{\pi p}\right)}$$

## 제8장

### ■ 연습문제 33

$$1. x = 4, y = 2$$

$$2. x = 3, y = 4$$

$$3. x = 2, y = 1.5$$

$$4. x = 4, y = 1$$

$$5. x = 3, y = 2$$

$$6. a = 2, b = 3$$

$$7. a = 5, b = 2$$

$$8. x = 1, y = 1$$

$$9. s = 2, t = 3$$

$$10. x = 3, y = -2$$

$$11. m = 2.5, n = 0.5$$

$$12. a = 6, b = -1$$

### ■ 연습문제 34

$$1. p = -1, q = -2$$

$$2. x = 4, y = 6$$

$$3. a = 2, b = 3$$

$$4. s = 4, t = -1$$

$$5. x = 3, y = 4$$

$$6. u = 12, v = 2$$

### ■ 연습문제 35

$$1. a = 0.2, b = 4$$

$$2. I_1 = 6.47, I_2 = 4.62$$

$$3. u = 12, a = 4, v = 26$$

$$4. m = -0.5, c = 3$$

$$5. a = 12, b = 0.40$$

$$6. F_1 = 1.5, F_2 = -4.5$$

$$7. R_1 = 5.7 \text{ kN}, R_2 = 6.3 \text{ kN}$$

## 제9장

### ■ 연습문제 36

$$1. (a) \text{ 수평축: } 1 \text{ cm} = 4 \text{ V (또는 } 1 \text{ cm} = 5 \text{ V)}, \text{ 수직축: } 1 \text{ cm} = 10 \Omega$$

$$(b) \text{ 수평축: } 1 \text{ cm} = 5 \text{ m}, \text{ 수직축: } 1 \text{ cm} = 0.1 \text{ V}$$

(c) 수평축:  $1\text{cm} = 10\text{N}$ , 수직축:  $1\text{cm} = 0.2\text{mm}$

2. (a)  $-1$  (b)  $-8$  (c)  $-1.5$  (d)  $5$       3.  $14.5$       4. (a)  $-1.1$  (b)  $-1.4$
5.  $1010\text{rev/min}$ 은  $1070\text{rev/min}$ 이 되어야 한다. ;  
(a)  $1000\text{rev/min}$  (b)  $167\text{V}$

### ■ 연습문제 37

1. 표시되지 않은 값들:  $-0.75, 0.25, 0.75, 1.75, 2.25, 2.75$ ; 기울기  $= \frac{1}{2}$
2. (a)  $4, -2$  (b)  $-1, 0$  (c)  $-3, -4$  (d)  $0, 4$
3. (a)  $6, -3$  (b)  $-2, 4$  (c)  $3, 0$  (d)  $0, 7$       4. (a)  $\frac{3}{5}$  (b)  $-4$  (c)  $-1\frac{5}{6}$
5. (a)와 (c), (b)와 (e)      6. 8.  $(2, 1)$
7. (a)  $89\text{cm}$  (b)  $11\text{N}$  (c)  $2.4$  (d)  $l = 2.4W + 48$

### ■ 연습문제 38

1. (a)  $40^\circ\text{C}$  (b)  $128\Omega$       2. (a)  $850\text{rev/min}$  (b)  $77.5\text{V}$
3. (a)  $0.25$  (b)  $12\text{N}$  (c)  $F = 0.25L + 12$  (d)  $89.5\text{N}$  (e)  $592\text{N}$  (f)  $212\text{N}$
4. (a)  $22.5\text{m/s}$  (b)  $6.5\text{s}$  (c)  $v = 0.7t + 15.5$
5.  $m = 26.8L$       6. (a)  $\frac{1}{5}$  (b)  $6$  (c)  $E = \frac{1}{5}L + 6$  (d)  $12\text{N}$  (e)  $65\text{N}$
7.  $a = 0.85, b = 12,254.3\text{kPa}, 275.5\text{kPa}, 280\text{K}$

## 제10장

### ■ 연습문제 39

1.  $24\text{m}$       2.  $9.54\text{mm}$       3.  $20.81\text{cm}$       4.  $7.21\text{m}$       5.  $11.18\text{cm}$
6.  $24.11\text{mm}$       7.  $20.81\text{km}$       8.  $3.35\text{m}, 10\text{cm}$       9.  $132.7$  해리

### ■ 연습문제 40

1.  $\sin Z = \frac{9}{41}, \cos Z = \frac{40}{41}, \tan X = \frac{40}{9}, \cos X = \frac{9}{41}$
2.  $\sin A = \frac{3}{5}, \cos A = \frac{4}{5}, \tan A = \frac{3}{4}, \sin B = \frac{4}{5}, \cos B = \frac{3}{5}, \tan B = \frac{4}{3}$
3.  $\sin A = \frac{8}{17}, \tan A = \frac{8}{15}$       4. (a)  $\frac{15}{17}$  (b)  $\frac{15}{17}$  (c)  $\frac{8}{15}$
5. (a)  $\sin \theta = \frac{7}{25}$  (b)  $\cos \theta = \frac{24}{25}$       6.  $9.434$

### ■ 연습문제 41

1.  $2.7550$       2.  $4.846$       3.  $36.52$       4. (a)  $-0.1010$  (b)  $0.5865$
5.  $42.33^\circ$       6.  $15.25^\circ$       7.  $73.78^\circ$       8.  $7^\circ 56'$       9.  $31^\circ 22'$       10.  $41^\circ 54'$
11.  $29.05^\circ$       12.  $20^\circ 21'$       13. (a)  $40^\circ$  (b)  $6.79\text{m}$

### ■ 연습문제 42





■ 연습문제 48

1.  $1932\text{mm}^2$       2.  $1624\text{mm}^2$       3. (a)  $0.918\text{ha}$  (b)  $456\text{m}$

■ 연습문제 49

1.  $80\text{ha}$       2.  $80\text{m}^2$       3.  $3.14\text{ha}$

제12장

■ 연습문제 50

1.  $45.24\text{cm}$       2.  $259.5\text{mm}$       3.  $2.629\text{cm}$       4.  $47.68\text{cm}$   
5.  $38.73\text{cm}$       6.  $12730\text{km}$       7.  $97.13\text{mm}$

■ 연습문제 51

1. (a)  $\frac{\pi}{6}$  (b)  $\frac{5\pi}{12}$  (c)  $\frac{5\pi}{4}$       2. (a)  $0.838$  (b)  $1.481$  (c)  $4.054$   
3. (a)  $210^\circ$  (b)  $80^\circ$  (c)  $105^\circ$       4. (a)  $0^\circ 43'$  (b)  $154^\circ 8'$  (c)  $414^\circ 53'$   
5.  $104.7\text{rad/s}$

■ 연습문제 52

1.  $113\text{cm}^2$       2.  $2376\text{mm}^2$       3.  $1790\text{mm}^2$       4.  $802\text{mm}^2$       5.  $1709\text{mm}^2$   
6.  $1269\text{m}^2$       7.  $1548\text{m}^2$       8. (a)  $106.0\text{cm}$  (b)  $783.9\text{cm}^2$       9.  $21.46\text{m}^2$   
10.  $17.80\text{cm}$ ,  $74.07\text{cm}^2$       11. (a)  $59.86\text{mm}$  (b)  $197.8\text{mm}$       12.  $26.2\text{cm}$   
13.  $82.5^\circ$       14.  $748$       15. (a)  $0.698\text{rad}$  (b)  $804.2\text{m}^2$       16.  $10.47\text{m}^2$   
17. (a)  $396\text{mm}^2$  (b)  $42.24\%$       18.  $701.8\text{mm}$       19.  $7.74\text{mm}$

## 제13장

### ■ 연습문제 53

1.  $1.2\text{m}^3$
2.  $5\text{cm}^3$
3.  $8\text{cm}^3$
4. (a)  $3840\text{mm}^3$  (b)  $1792\text{mm}^2$
5. 972L
6.  $15\text{cm}^3$ , 135g
7. 500L
8.  $1.44\text{m}^3$
9. (a)  $35.3\text{cm}^3$  (b)  $61.3\text{cm}^2$
10. (a)  $2400\text{cm}^3$  (b)  $2460\text{cm}^2$
11. 37.04m
12.  $8796\text{cm}^3$
13. 4.709cm,  $153.9\text{cm}^2$
14. 2.99cm
15.  $28060\text{cm}^3$ ,  $1.099\text{m}^2$
16.  $8.22\text{m} \times 8.22\text{m}$
17. 4cm
18.  $4.08\text{m}^3$

### ■ 연습문제 54

1.  $201.1\text{cm}^3$ ,  $159.0\text{cm}^2$
2.  $7.68\text{cm}^3$ ,  $25.81\text{cm}^2$
3.  $113.1\text{cm}^3$ ,  $113.1\text{cm}^2$
4. 3cm
5.  $2681\text{mm}^3$
6. (a)  $268083\text{mm}^3$ ,  $268.083\text{cm}^3$  (b)  $20106\text{mm}^2$ ,  $201.06\text{cm}^2$
7. 8.53cm
8. (a)  $512 \times 106\text{km}^2$  (b)  $1.09 \times 1012\text{km}^3$
9. 664
10.  $92\text{m}^3$ , 92,000L

### ■ 연습문제 55

1.  $5890\text{mm}^2$ ,  $58.90\text{cm}^2$
2. (a)  $56.55\text{cm}^3$  (b)  $84.82\text{cm}^2$
3. 13.57kg
4.  $29.32\text{cm}^3$
5.  $393.4\text{m}^2$
6. (i) (a)  $670\text{cm}^3$  (b)  $523\text{cm}^2$  (ii) (a)  $180\text{cm}^3$  (b)  $154\text{cm}^2$   
(iii) (a)  $56.5\text{cm}^3$  (b)  $84.8\text{cm}^2$  (iv) (a)  $10.4\text{cm}^3$  (b)  $32.0\text{cm}^2$   
(v) (a)  $96.0\text{cm}^3$  (b)  $146\text{cm}^2$  (vi) (a)  $86.5\text{cm}^3$  (b)  $142\text{cm}^2$   
(vii) (a)  $805\text{cm}^3$  (b)  $539\text{cm}^2$
7. (a) 17.9cm (b) 38.0cm
8.  $10.3\text{m}^3$ ,  $25.5\text{m}^2$
9. 6560L
10.  $657.1\text{cm}^3$ ,  $1027\text{cm}^2$
11. (a) 1458L (b)  $9.77\text{m}^2$  (c) 1404500원

### ■ 연습문제 56

1. 8:125
2. 137.2g

## 제14장

### ■ 연습문제 58

1. (a)  $0.052 \text{ m}$  (b)  $0.02 \text{ m}^2$  (c)  $0.01 \text{ m}^3$
2. (a)  $12.5 \text{ m}^2$  (b)  $12.5 \times 10^6 \text{ mm}^2$
3. (a)  $37.5 \text{ m}^3$  (b)  $37.5 \times 10^9 \text{ mm}^3$
4. (a)  $0.0063 \text{ m}^3$  (b)  $6300 \text{ cm}^3$  (c)  $6.3 \times 10^6 \text{ mm}^3$

### ■ 연습문제 59

1.  $11,400 \text{ kg/m}^3$  2.  $1.5 \text{ kg}$  3.  $20 \text{ litres}$  4.  $8.9$
5.  $8000 \text{ kg/m}^3$  6. (a)  $800 \text{ kg/m}^3$   
(b)  $0.0025 \text{ m}^3$  or  $2500 \text{ cm}^3$

### ■ 연습문제 60

답안 생략(본문 내용 참조)

### ■ 연습문제 61

1. (c) 2. (d) 3. (b) 4. (a) 5. (b)
6. (c) 7. (b) 8. (b) 9. (c) 10. (a)

## 제15장

### ■ 연습문제 62

1. (a) 혼합물 (b) 화합물 (c) 혼합물 (d) 원소
2.  $1.2 \text{ kg}$  3. [그림 15-1] 참조
4. [그림 15-2] 참조

### ■ 연습문제 63

답안 생략(본문 내용 참조)

### ■ 연습문제 64

1. (d) 2. (c) 3. (a) 4. (b)
5. (a) 6. (b) 7. (b) 8. (c)

## 제16장

### ■ 연습문제 65

1. (a)  $72 \text{ km/h}$  (b)  $20 \text{ m/s}$  2.  $3.6 \text{ km}$
3.  $3 \text{ days } 19 \text{ hours}$

### ■ 연습문제 66

1. 0 to A,  $30 \text{ km/h}$ ; A to B,  $40 \text{ km/h}$ ; B to C,  $10 \text{ km/h}$ ;  
0 to C,  $24 \text{ km/h}$ ; A to C,  $20 \text{ km/h}$
2.  $4 \text{ m/s}$ ,  $2.86 \text{ m/s}$ ,  $3.33 \text{ m/s}$ ,  $2.86 \text{ m/s}$ ,  $3.2 \text{ m/s}$
3.  $119 \text{ km}$  4.  $333.33 \text{ m/s}$  or  $1200 \text{ km/h}$
5.  $2.6 \times 10^{13} \text{ km}$

### ■ 연습문제 67

1.  $12.5 \text{ km}$  2.  $4 \text{ m/s}$

### ■ 연습문제 68

답안 생략(본문 내용 참조)

### ■ 연습문제 69

1. (c) 2. (g) 3. (d) 4. (c) 5. (e) 6. (b) 7. (a)
8. (b) 9. (d) 10. (a) 11. (a) 12. (b) 13. (c) 14. (d)

## 제17장

### ■ 연습문제 70

1.  $50 \text{ s}$  2.  $9.26 \times 10^{-4} \text{ m/s}^2$
3. (a)  $0.0231 \text{ m/s}^2$  (b) 0 (c)  $-0.370 \text{ m/s}^2$
4. A to B,  $-2 \text{ m/s}^2$ ; B to C,  $2.5 \text{ m/s}^2$ ; C to D,  $-1.5 \text{ m/s}^2$

### ■ 연습문제 71

1.  $12.25 \text{ m/s}$  2.  $10.2 \text{ s}$  3.  $7.6 \text{ m/s}$
4.  $39.6 \text{ km/h}$  5.  $2 \text{ min } 5 \text{ s}$  6.  $1.35 \text{ m/s}$ ,  $-0.45 \text{ m/s}^2$

### ■ 연습문제 72

답안 생략(본문 내용 참조)

### ■ 연습문제 73

1. (b) 2. (a) 3. (c) 4. (e) 5. (i)
6. (g) 7. (d) 8. (c) 9. (a) 10. (d)

## 제18장

### ■ 연습문제 74

1.  $873 \text{ N}$  2.  $1.87 \text{ kN}$ ,  $6.55 \text{ s}$
3.  $0.560 \text{ m/s}^2$  4.  $16.46 \text{ kN}$
5. (a)  $11.62 \text{ kN}$  (b)  $19.62 \text{ kN}$  (c)  $24.62 \text{ kN}$

■ 연습문제 75

1. 988 N, 34.86 km/h    2. 0.3 m/s<sup>2</sup>    3. 10 kg

■ 연습문제 76

답안 생략(본문 내용 참조)

■ 연습문제 77

1. (c)    2. (b)    3. (a)    4. (d)    5. (a)    6. (b)  
7. (b)    8. (a)    9. (a)    10. (d)    11. (d)    12. (c)

제19장

■ 연습문제 78

1. 힘의 방향으로 4.0 kN  
2. 538 N 힘의 방향으로 68 N  
3. 36.8 N at 20°    4. 12.6 N at 79°  
5. 3.4 kN at -8°

■ 연습문제 79

1. 2.6 N at -20°    2. 15.7 N at -172°  
3. 26.7 N at -82°    4. 0.86 kN at -101°  
5. 15.5 N at -152°

■ 연습문제 80

1. 11.52 kN at 105°    2. 36.84 N at 19.83°  
3. 3.38 kN at -8.19°    4. 15.69 N at -171.67°  
5. 0.86 kN at -100.94°

■ 연습문제 81

1. 3.1 N at -45° to force A  
2. 53.5 kN at 37° to force I (i.e. 117° to the horizontal)  
3. 72 kN at -37° to force P  
4. 43.2 N, 39° East of North

■ 연습문제 82

1. 5.86 N, 8.06 N    2. 9.96 kN, 7.77 kN  
3. 100 N force at 148° to the 60 N force, 90 N force at 277° to the 60 N force

■ 연습문제 83

1. 10.08 N, 20.67 N    2. 9.09 N at 93.92°  
3. 3.06 N at -45.40° to force A  
4. 53.50 kN at 37.27° to force I (i.e. 117.27° to the horizontal)  
5. 18.82 kN at 210.03° to the horizontal  
6. 34.96 N at -10.23° to the horizontal

■ 연습문제 84

답안 생략(본문 내용 참조)

■ 연습문제 85

1. (b)    2. (a)    3. (b)    4. (d)    5. (b)    6. (c)    7. (b)  
8. (b)    9. (c)    10. (d)    11. (c)    12. (d)    13. (d)    14. (a)

제20장

■ 연습문제 86

1. 75 kJ    2. 20 kJ    3. 50 kJ  
4. 1.6 J    5. (a) 2.5 J    (b) 2.1 J    6. 6.15 kJ

■ 연습문제 87

1. 75%    2. 1.2 kJ    3. 4 m    4. 10 kJ

■ 연습문제 88

1. 600 kJ    2. 4 kW  
3. (a) 500 N (b) 625 W    4. (a) 10.8 MJ (b) 12 kW  
5. 160 m    6. (a) 72 MJ (b) 100 MJ  
7. 13.5 kW    8. 480 W  
9. 100 kW    10. 90 W

■ 연습문제 89

1. 8.31 m    2. 196.2 J  
3. 90 kJ    4. 176.6 kJ, 176.6 kJ  
5. 200 kJ, 2039 m    6. 8 kJ, 14.0 m/s  
7. 4.85 m/s (a) 2.83 m/s (b) 14.70 kN

■ 연습문제 90

답안 생략(본문 내용 참조)

■ 연습문제 91

1. (b) 2. (c) 3. (c) 4. (a) 5. (d)
6. (c) 7. (a) 8. (d) 9. (c) 10. (b)
11. (b) 12. (a) 13. (d) 14. (a) 15. (d)

제21장

■ 연습문제 92

1. 4.5 N m 2. 200 mm 3. 150 N

■ 연습문제 93

1. 50 mm, 3.8 kN 2. 560 N
3.  $R_A = R_B = 25$  N 4. 5 N, 25 mm

■ 연습문제 94

1. 2.0 kN, 24 mm 2. 1.0 kN, 64 mm 3. 80 m
4. 36 kN 5. 50 N, 150 N
6. (a)  $R_1 = 3$  kN,  $R_2 = 12$  kN (b) 15.5 kN

■ 연습문제 95

답안 생략(본문 내용 참조)

■ 연습문제 96

1. (a) 2. (c) 3. (a) 4. (d) 5. (a)
6. (d) 7. (c) 8. (a) 9. (d) 10. (c)

제22장

■ 연습문제 97

1.  $\omega = 90$  rad/s,  $v = 16.2$  m/s
2.  $\omega = 40$  rad/s,  $v = 10$  m/s

■ 연습문제 98

1. 275 rad/s,  $8250/\pi$  rev/min
2.  $0.4\pi$  rad/s<sup>2</sup>,  $0.1\pi$  m/s<sup>2</sup>

■ 연습문제 99

1. 2.693 s 2. 222.8 rad/s<sup>2</sup> 3. 187.5 revolutions
4. (a) 160 rad/s (b) 4 rad/s<sup>2</sup> (c)  $12,000/\pi$  rev

■ 연습문제 100

1. 83.5 km/h at 71.6° to the vertical
2. 4 min 55 s, 60°
3. 22.79 km/h in a direction E 9.78° N

■ 연습문제 101

답안 생략(본문 내용 참조)

■ 연습문제 102

1. (b) 2. (c) 3. (a) 4. (c) 5. (a) 6. (d) 7. (c)
8. (b) 9. (d) 10. (c) 11. (b) 12. (d) 13. (a)

제23장

■ 연습문제 103

1. 1250 N 2. 0.24 3. (a) 675 N (b) 652.5 N

■ 연습문제 104

답안 생략(본문 내용 참조)

■ 연습문제 105

1. (c) 2. (c) 3. (f) 4. (e) 5. (i)
6. (c) 7. (h) 8. (b) 9. (d) 10. (a)

제24장

■ 연습문제 106

1. (a) 3.3 (b) 11 (c) 30% 2. 8
3. (a) 5 (b) 500 mm
4. (a)  $F_e = 0.04F_l + 170$  (b) 25 (c) 83.3%
5. 410 N, 48%

■ 연습문제 107

1. 60% 2. 1.5 kN, 93.75%

■ 연습문제 108

1. 9.425 kN 2. 16.91 N

■ 연습문제 109

1. 6, 10 rev/s 2. 6, 4.32 3. 250, 3.6



■ 연습문제 110

1. 1.25 m 2. 250 N 3. 333.3 N, 1/3

■ 연습문제 111

답안 생략(본문 내용 참조)

■ 연습문제 112

1. (b) 2. (f) 3. (c) 4. (d) 5. (b) 6. (a)  
7. (b) 8. (d) 9. (c) 10. (d) 11. (d) 12. (b)

제25장

■ 연습문제 113

1. 250 MPa 2. 12.78 mm 3. 69.44 MPa  
4. 2.356 kN 5. 2.06 mm 6. 38.2 MPa

■ 연습문제 114

1. 2.25 mm 2. (a) 0.00002 (b) 0.002%  
3. 0.00025, 0.025%  
4. (a) 212.2 MPa (b) 0.002 or 0.20%  
5. (a) 25 kPa (b) 0.04 or 4%

■ 연습문제 115

1. 800 N 2. 10 mm  
3. (a) 43.75 kN (b) 1.2 mm  
4. (a) 19 kN (b) 0.057 mm  
5. 132.6 GPa 6. (a) 27.5 mm (b) 68.2 GPa  
7. 0.10%

■ 연습문제 116

답안 생략(본문 내용 참조)

■ 연습문제 117

1. (c) 2. (c) 3. (a) 4. (b) 5. (c) 6. (c) 7. (b)  
8. (d) 9. (b) 10. (c) 11. (f) 12. (h) 13. (d)

제26장

■ 연습문제 118

1. 250 kg m/s 2. 2.4 kg m/s 3. 64 kg  
4. 22,500 kg m/s 5. 90 km/h 6. 2 m/s  
7. 10.71 m/s 8. (a) 26.25 m/s (b) 11.25 m/s

■ 연습문제 119

1. 8 kg m/s 2. 1.5 m/s 3. 1 kN  
4. (a) 200 kg m/s (b) 8 kN 5. 314.5 kN  
6. (a) 1.5 kg m/s (b) 150 N 7. 3600 kg m/s

■ 연습문제 120

답안 생략(본문 내용 참조)

■ 연습문제 121

1. (d) 2. (b) 3. (f) 4. (c) 5. (a) 6. (c)  
7. (a) 8. (g) 9. (f) 10. (f) 11. (b) 12. (e)

제27장

■ 연습문제 122

1. 70 N m 2. 160 mm

■ 연습문제 123

1. 339.3 kJ 2. 523.8 rev 3. 45 N m  
4. 12.66 N m 5. 13.75 rad/s 6. 16.76 MW  
7. 27.52 MW 8. (a) 3.33 N m (b) 540 kJ

■ 연습문제 124

1. 272.4 N m 2. 30 kg m<sup>2</sup>  
3. 502.65 kJ, 1934 rev/min  
4. 1.885 kJ, 1209.5 rev/min  
5. 6.283 kN m 6. 16.36 J  
7. (a)  $2.857 \times 10^{-3}$  kg m<sup>2</sup> (b) 24.48 J

■ 연습문제 125

1. 6.05 kW 2. 70.37%, 280 mm 3. 57.03%  
4. 404.2 N, 300 rev/min 5. 545.5 W  
6. 4.905 MJ, 1 min 22 s

■ 연습문제 126

답안 생략(본문 내용 참조)

■ 연습문제 127

1. (d) 2. (b) 3. (c) 4. (a) 5. (c) 6. (d)  
7. (a) 8. (b) 9. (c) 10. (d) 11. (a) 12. (c)

## 제28장

### ■ 연습문제 128

1. 28 kPa    2. 4.5 kN    3. 56 kPa

### ■ 연습문제 129

1. 343 kPa    2. (a) 303 Pa (b) 707 Pa    3. 1400 kg/m<sup>3</sup>

### ■ 연습문제 130

1. 100 kPa    2. 134 kPa    3. 97.9 kPa    4. 743 mm

### ■ 연습문제 131

1. 1.215 kN    2. 15.25 N    3. 0.03222 m<sup>3</sup>  
4. 148.6 N    5. 2.47 kN    6. 4.186 tonne/m<sup>3</sup>, 4.186  
7. 159 mm    8. 1.551 kN

### ■ 연습문제 132

답안 생략(본문 내용 참조)

### ■ 연습문제 133

1. (b)    2. (d)    3. (a)    4. (a)    5. (c)    6. (d)    7. (b)  
8. (c)    9. (c)    10. (d)    11. (d)    12. (d)    13. (c)    14. (b)  
15. (c)    16. (a)    17. (b)    18. (f)    19. (a)    20. (b)    21. (c)

## 제29장

### ■ 연습문제 134

1. (a) 324 K (b) 195 K (c) 456 K  
2. (a) 34°C (b) -36°C (c) 142°C

### ■ 연습문제 135

1. 2.1 MJ    2. 390 kJ    3. 5 kg    4. 130 J/kg °C    5. 65°C

### ■ 연습문제 136

[그림 29-1]과 유사(본문 내용 참조)

### ■ 연습문제 137

1. 8.375 MJ    2. 18.08 MJ    3. 3.98 MJ    4. 12.14 MJ

### ■ 연습문제 138

답안 생략(본문 내용 참조)

### ■ 연습문제 139

1. (d)    2. (b)    3. (a)    4. (c)    5. (b)  
6. (b)    7. (b)    8. (a)    9. (c)    10. (b)  
11. (d)    12. (c)    13. (d)

## 제30장

### ■ 연습문제 140

1. 50.0928 m    2.  $6.45 \times 10^{-6} \text{ K}^{-1}$   
3. 20.4 mm    4. (a) 0.945 mm (b) 0.045%  
5. 0.45 mm    6. 47.26°C  
7. 6.75 mm    8. 74 K

### ■ 연습문제 141

1. 2.584 mm<sup>2</sup>    2. 358.8 K  
3. (a) 0.372 mm (b) 280.5 mm<sup>2</sup> (c) 4207 mm<sup>3</sup>  
4. 29.7 mm<sup>3</sup>    5. 2.012 litres  
6. 50.4 litres    7. 0.03025 litres

### ■ 연습문제 142

답안 생략(본문 내용 참조)

### ■ 연습문제 143

1. (b)    2. (c)    3. (a)    4. (d)    5. (b)  
6. (c)    7. (c)    8. (a)    9. (c)    10. (b)

## 제31장

### ■ 연습문제 144

1. 0.3 m<sup>3</sup>    2. 125 kPa    3. 400 kPa    4. 24 kN  
5. 2000 mm of mercury

### ■ 연습문제 145

1. 1.02 m<sup>3</sup>    2. -57°C    3. 54.5°C  
4. 28.5 litres

### ■ 연습문제 146

1. 141 kPa    2. 720°C

### ■ 연습문제 147

1. 180 kPa



■ 연습문제 148

1.  $0.363 \text{ m}^3$     2.  $2.30 \text{ m}^3$     3.  $34.0 \text{ litres}$   
4.  $1.24 \text{ kg}$     5.  $1.24 \text{ kg}$     6.  $300 \text{ J/(kg K)}$   
7.  $4160 \text{ J/(kg K)}$     8.  $291^\circ\text{C}$     9.  $177^\circ\text{C}$   
10.  $0.181 \text{ kg}$     11.  $184 \text{ J/(kg K)}$

■ 연습문제 149

1.  $1.24 \text{ MPa}$     2.  $0.60 \text{ m}^3, 0.72 \text{ m}^3$   
3. (a)  $57.4 \text{ kPa}$ ,  $142.6 \text{ kPa}$  (b)  $1.94 \text{ kg}$   
4. (a)  $0.0068 \text{ m}^3$  (b)  $0.050 \text{ kg}$   
5. (a)  $2.33 \text{ kg}$  (b)  $1.83 \text{ m}^3$

■ 연습문제 150

답안 생략(본문 내용 참조)

■ 연습문제 151

1. (a)    2. (d)    3. (b)    4. (b)    5. (c)  
6. (d)    7. (b)    8. (c)    9. (c)    10. (b)

제32장

■ 연습문제 152

1.  $1270^\circ\text{C}$

■ 연습문제 153

1.  $203^\circ\text{C}$

■ 연습문제 154

답안 생략(본문 내용 참조)

■ 연습문제 155

1. (c)    2. (b)    3. (d)    4. (b)    5. (i)    6. (a)  
7. (e)    8. (d)    9. (e) or (f)    10. (k)    11. (b)    12. (g)

제33장

■ 연습문제 156

1.  $5 \text{ s}$     2.  $3600 \text{ C}$     3.  $13 \text{ min } 20 \text{ s}$

■ 연습문제 157

1.  $7 \Omega$     2.  $0.25 \text{ A}$     3.  $2 \text{ m}\Omega, 5 \text{ m}\Omega$     4.  $30 \text{ V}$

■ 연습문제 158

1.  $0.4 \text{ A}$ ,  $100 \text{ W}$     2.  $20 \Omega$ ,  $2.88 \text{ kW}$ ,  $57.6 \text{ kWh}$   
3.  $0.8 \text{ W}$     4.  $9.5 \text{ W}$     5.  $2.5 \text{ V}$   
6. (a)  $0.5 \text{ W}$  (b)  $1.33 \text{ W}$  (c)  $40 \text{ W}$   
7.  $8 \text{ kW}$ ,  $20 \text{ A}$     8.  $5 \text{ kW}$     9.  $\text{£}26.70$   
10.  $3 \text{ kW}$ ,  $90 \text{ kWh}$ ,  $\text{£}12.15$

■ 연습문제 159

1.  $3 \text{ A}$ ,  $5 \text{ A}$

■ 연습문제 160

답안 생략(본문 내용 참조)

■ 연습문제 161

1. (d)    2. (a)    3. (c)    4. (b)    5. (d)    6. (d)  
7. (b)    8. (c)    9. (a)    10. (a)    11. (c)    12. (c)  
13. (b)    14. (a)    15. (c)    16. (b)    17. (d)    18. (d)

제34장

■ 연습문제 162

1. (a)  $8.75 \Omega$  (b)  $5 \text{ m}$     2. (a)  $5 \Omega$  (b)  $0.625 \text{ mm}^2$   
3.  $0.32 \Omega$     4.  $0.8 \Omega$   
5.  $1.5 \text{ mm}^2$     6.  $0.026 \mu\Omega\text{m}$   
7.  $0.216 \Omega$

■ 연습문제 163

1.  $69 \Omega$     2.  $24.69 \Omega$     3.  $488 \Omega$     4.  $26.4 \Omega$   
5.  $70^\circ\text{C}$     6.  $64.8 \Omega$     7.  $5.95 \Omega$

■ 연습문제 164

답안 생략(본문 내용 참조)

■ 연습문제 165

1. (c)    2. (d)    3. (b)    4. (d)  
5. (d)    6. (c)    7. (b)

### 제35장

#### ■ 연습문제 166

1. (a) 18 V, 2.88  $\Omega$  (b) 1.5 V, 0.02  $\Omega$
2. (a) 2.17 V (b) 1.6 V (c) 0.7 V
3. 0.25  $\Omega$       4. 18 V, 1.8  $\Omega$       5. (a) 1 A (b) 21 V
6. (i)(a) 6 V (b) 2 V (ii)(a) 4  $\Omega$  (b) 0.25  $\Omega$
7. 0.04  $\Omega$ , 51.2 V

#### ■ 연습문제 167

답안 생략(본문 내용 참조)

#### ■ 연습문제 168

1. (d)    2. (a)    3. (b)    4. (c)    5. (b)
6. (d)    7. (d)    8. (b)    9. (c)    10. (d)
11. (c)    12. (a)    13. (c)

### 제36장

#### ■ 연습문제 169

1. (a) 22 V (b) 11  $\Omega$  (c) 2.5  $\Omega$ , 3.5  $\Omega$ , 5  $\Omega$
2. 10 V, 0.5 A, 20  $\Omega$ , 10  $\Omega$ , 6  $\Omega$
3. 4 A, 2.5  $\Omega$     4. 45 V      5. (a) 1.2  $\Omega$  (b) 12 V
6. 6.77  $\Omega$       7. (a) 4  $\Omega$  (b) 48 V

#### ■ 연습문제 170

1. (a) 3  $\Omega$  (b) 3 A (c) 2.25 A, 0.75 A
2. 2.5 A, 2.5  $\Omega$
3. (a)(i) 5  $\Omega$  (ii) 60 k $\Omega$  (iii) 28  $\Omega$  (iv) 6.3 k $\Omega$   
(b)(i) 1.2  $\Omega$  (ii) 13.33 k $\Omega$  (iii) 2.29  $\Omega$  (iv) 461.54  $\Omega$
4. 8  $\Omega$       5. 27.5  $\Omega$       6. 2.5  $\Omega$ , 6 A
7. (a) 1.6 A (b) 6  $\Omega$       8. (a) 30 V (b) 42 V
9.  $I_1 = 5$  A,  $I_2 = 2.5$  A,  $I_3 = 1.67$  A,  $I_4 = 0.83$  A,  $I_5 = 3$  A,  
 $I_6 = 2$  A,  $V_1 = 20$  V,  $V_2 = 5$  V,  $V_3 = 6$  V
10. 1.8 A

#### ■ 연습문제 171

1. 400  $\Omega$       2. (a) 70 V (b) 210 V

#### ■ 연습문제 172

답안 생략(본문 내용 참조)

#### ■ 연습문제 173

1. (a)    2. (c)    3. (c)    4. (c)    5. (a)
6. (d)    7. (b)    8. (c)    9. (d)    10. (d)

### 제37장

#### ■ 연습문제 174

1.  $I_3 = 2$  A,  $I_4 = -1$  A,  $I_6 = 3$  A
2. (a)  $I_1 = 4$  A,  $I_2 = -1$  A,  $I_3 = 13$  A  
(b)  $I_1 = 40$  A,  $I_2 = 60$  A,  $I_3 = 120$  A,  
 $I_4 = 100$  A,  $I_5 = -80$  A
3. 2.162 A, 42.09 W
4. 2.716 A, 7.407 V, 3.951 V
5. (a) 60.38 mA (b) 15.10 mA  
(c) 45.28 mA (d) 34.20 mW
6.  $I_1 = 1.26$  A,  $I_2 = 0.74$  A,  $I_3 = 0.16$  A,  
 $I_4 = 1.42$  A,  $I_5 = 0.58$  A

#### ■ 연습문제 175

답안 생략(본문 내용 참조)

#### ■ 연습문제 176

1. (a)    2. (d)    3. (c)    4. (b)    5. (c)

### 제38장

#### ■ 연습문제 177

1. 1.5 T    2. 2.7 mWb    3. 32 cm    4. 4 cm by 4 cm

#### ■ 연습문제 178

1. 21.0 N, 14.8 N    2. 4.0 A    3. 0.80 T    4. 0.582 N
5. (a) 14.2 mm (b) towards the viewer

#### ■ 연습문제 179

1.  $8 \times 10^{-19}$  N      2.  $10^6$  m/s

#### ■ 연습문제 180

답안 생략(본문 내용 참조)

#### ■ 연습문제 181

1. (d)    2. (d)    3. (a)    4. (a)    5. (b)    6. (b)
7. (d)    8. (c)    9. (d)    10. (a)    11. (c)    12. (c)

## 제39장

### ■ 연습문제 182

1. 0.135 V      2. 25 m/s      3. (a) 0 (b) 0.16 A
4. 1 T, 0.25 N      5. 1.56 mV
6. (a) 48 V (b) 33.9 V (c) 24 V
7. (a) 10.21 V (b) 0.408 N

### ■ 연습문제 183

1. 4.5 V      2. 1.6 mH      3. 250 V
4. (a) -180 V (b) 5.4 mWb

### ■ 연습문제 184

1. 96      2. 990 V      3. 16 V
4. 3000 turns      5. 12 V, 60 A      6. 50 A
7. 16 V, 45 A      8. 225 V, 3:2

### ■ 연습문제 185

답안 생략(본문 내용 참조)

### ■ 연습문제 186

1. (c)      2. (b)      3. (c)      4. (a)      5. (d)
6. (a)      7. (b)      8. (c)      9. (d)      10. (a)
11. (b)      12. (a)      13. (d)      14. (b) and (c)

## 제40장

### ■ 연습문제 187

1. (a) 0.4 s (b) 10 ms (c) 25  $\mu$ s
2. (a) 200 Hz (b) 20 kHz (c) 5 Hz
3. 800 Hz

### ■ 연습문제 188

1. (a) 50 Hz (b) 5.5 A, 3.1 A (c) 2.8 A (d) 4.0 A
2. (a) (i) 100 Hz (ii) 2.50 A (iii) 2.87 A  
(iv) 1.15 (v) 1.74  
(b) (i) 250 Hz (ii) 20 V (iii) 20 V (iv) 1.0 (v) 1.0  
(c) (i) 125 Hz (ii) 18 A (iii) 19.56 A  
(iv) 1.09 (v) 1.23  
(d) (i) 250 Hz (ii) 25 V (iii) 50 V (iv) 2.0 (v) 2.0
3. (a) 150 V (b) 170 V
4. 212.1 V

5. 282.9 V, 180.2 V

6. 84.8 V, 76.4 V

7. 23.55 A, 16.65 A

### ■ 연습문제 189

답안 생략(본문 내용 참조)

### ■ 연습문제 190

1. (b)      2. (c)      3. (d)      4. (d)      5. (a)
6. (d)      7. (c)      8. (b)      9. (c)      10. (b)

## 제41장

### ■ 연습문제 191

1. 2.5 mC      2. 2 kV      3. 2.5  $\mu$ F
4. 1.25 ms      5. 2 kV      6. 750 kV/m
7. 312.5  $\mu$ C/m<sup>2</sup>, 50 kV/m

### ■ 연습문제 192

1. 885 pF      2. 0.885 mm      3. 7      4. 2.97 mm      5. 200 pF

### ■ 연습문제 193

1. (a) 8  $\mu$ F (b) 1.5  $\mu$ F
2. 15  $\mu$ F
3. (a) 0.06  $\mu$ F (b) 0.25  $\mu$ F
4. 2.4  $\mu$ F, 2.4  $\mu$ F
5. (a) 1.2  $\mu$ F (b) 100 V
6. 4.2  $\mu$ F each

### ■ 연습문제 194

1. (a) 0.02  $\mu$ F (b) 0.4 mJ      2. 20 J      3. 550 V
4. (a) 0.04 mm (b) 361.6 cm<sup>2</sup> (c) 0.02 J (d) 1 kW

### ■ 연습문제 195

1. -150 V      2. 144 ms      3. 0.8 Wb/s
4. 3.5 V      5. -90 V

### ■ 연습문제 196

1. 62.5 J      2. 0.18 mJ      3. 40 H

■ 연습문제 197

1. (a) 7.2 H (b) 90 J (c) 180 V
2. 4 H
3. 40 ms
4. 12.5 H, 1.25 kV
5. 12,500

■ 연습문제 198

답안 생략(본문 내용 참조)

■ 연습문제 199

1. (a) 2. (b) 3. (c) 4. (a) 5. (b)
6. (b) 7. (c) 8. (c) 9. (c) 10. (d)
11. (c) 12. (b) 13. (d) 14. (a)

## 제42장

■ 연습문제 200

1. (a) 0.250 A (b) 0.238 A (c) 2.832 W (d) 56.64 W
2. (a) 900 W (b) 904.5 W

■ 연습문제 201

1. (a) 41.7 Hz (b) 176 V
2. (a) 0.56 Hz (b) 8.4 V
3. (a) 7.14 Hz (b) 220 V (c) 77.78 V

■ 연습문제 202

1. 3 k $\Omega$
2. 1.525 V

■ 연습문제 203

답안 생략(본문 내용 참조)

■ 연습문제 204

1. (f) 2. (c) 3. (a) 4. (i) 5. (j)
6. (g) 7. (c) 8. (b) 9. (p) 10. (d)
11. (o) 12. (n) 13. (a)

■ 연습문제 205

답안 생략(본문 내용 참조)

■ 연습문제 206

1. (d) 2. (a) 3. (c) 4. (d)
5. (b) 6. (a) 7. (b) 8. (c)