

APPENDIX II

ANSWERS TO MULTIPLE-CHOICE QUESTIONS

Chapter-1

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|---------|----------|----------|---------|
| 1.1 (d) | 1.2 (a) | 1.3 (d) | 1.4 (c) |
| 1.5 (b) | 1.6 (a) | 1.7 (d) | 1.8 (d) |
| 1.9 (b) | 1.10 (d) | 1.11 (c) | |

Chapter-2

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|---------|----------|----------|---------|
| 2.1 (a) | 2.2 (c) | 2.3 (a) | 2.4 (b) |
| 2.5 (a) | 2.6 (b) | 2.7 (b) | 2.8 (c) |
| 2.9 (c) | 2.10 (b) | 2.11 (a) | |

Chapter-3

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|---------|----------|----------|---------|
| 3.1 (d) | 3.2 (c) | 3.3 (d) | 3.4 (a) |
| 3.5 (b) | 3.6 (b) | 3.7 (d) | 3.8 (c) |
| 3.9 (a) | 3.10 (a) | 3.11 (b) | |

Chapter-4

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|---------|---------|---------|
| 4.1 (d) | 4.2 (c) | 4.3 (d) |
|---------|---------|---------|

Chapter-5

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|----------|----------|----------|----------|
| 5.1 (b) | 5.2 (d) | 5.3 (c) | 5.4 (c) |
| 5.5 (c) | 5.6 (d) | 5.7 (c) | 5.8 (a) |
| 5.9 (a) | 5.10 (d) | 5.11 (b) | 5.12 (c) |
| 5.13 (c) | | | |

Chapter-6

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|----------|----------|----------|----------|
| 6.1 (a) | 6.2 (c) | 6.3 (b) | 6.4 (b) |
| 6.5 (b) | 6.6 (c) | 6.7 (b) | 6.8 (a) |
| 6.9 (b) | 6.10 (a) | 6.11 (c) | 6.12 (c) |
| 6.13 (c) | 6.14 (a) | 6.15 (c) | 6.16 (b) |
| 6.17 (a) | 6.18 (a) | | |

Chapter-7

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|---------|---------|---------|---------|
| 7.1 (c) | 7.2 (d) | 7.3 (a) | 7.4 (b) |
| 7.5 (c) | | | |

APPENDIX II

Engineering Thermodynamics and Fluid Mechanics

Chapter-8

- 8.1 (b) 8.2 (d) 8.3 (b) 8.4 (c)

Chapter-9

- 9.1 (b) 9.2 (a) 9.3 (d) 9.4 (b)
9.5 (d) 9.6 (a) 9.7 (b) 9.8 (d)
9.9 (a) 9.10 (b) 9.11 (a)

Chapter-10

- 10.1 (c) 10.2 (a) 10.3 (c)

Chapter-11

- 11.1 (c) 11.2 (b) 11.3 (b) 11.4 (b)
11.5 (d) 11.6 (c) 11.7 (e) 11.8 (b)
11.9 (b) 11.10 (d) 11.11 (d) 11.12 (b)
11.13 (a) 11.14 (c) 11.15 (c) 11.16 (a)
11.17 (b) 11.18 (c) 11.19 (c) 11.20 (a)
11.21 (d) 11.22 (a) 11.23 (b) 11.24 (b)
11.25 (b) 11.26 (c) 11.27 (b) 11.28 (c)
11.29 (b) 11.30 (d) 11.31 (b)

Chapter-12

- 12.1 (c) 12.2 (d) 12.3 (c) 12.4 (d)
12.5 (c) 12.6 (c) 12.7 (c) 12.8 (a)
12.9 (c)

Chapter-13

- 13.1 (b) 13.2 (a) 13.3 (b) 13.4 (d)
13.5 (c) 13.6 (d) 13.7 (a) 13.8 (d)
13.9 (a) 13.10 (d) 13.11 (b) 13.12 (d)
13.13 (b) 13.14 (c) 13.15 (c) 13.16 (b)
13.17 (b) 13.18 (d) 13.19 (b) 13.20 (a)
13.21 (d) 13.22 (b) 13.23 (c)

Chapter-14

- 14.1 (c) 14.2 (c) 14.3 (a) 14.4 (d)
14.5 (b) 14.6 (b) 14.7 (c) 14.8 (c)
14.9 (b) 14.10 (d) 14.11 (a) 14.12 (c)
14.13 (b) 14.14 (d) 14.15 (d) 14.16 (c)
14.17 (a) 14.18 (c)

APPENDIX III

ANSWERS TO NUMERICAL PROBLEMS

Chapter-2

- 2.1 331.5°C, -13.27 kJ
2.2 (a) (i) 27.88 kJ (ii) -4 kJ (iii) -2.863 kJ (b) 21.017 kJ
2.3 25.2 kJ 2.4 (a) 9.1 kJ (b) 4.7 kJ (c) 4.7 kJ
2.5 44.5 kJ 2.6 125.85 kJ/kg
2.7 127.26 kJ 2.8 2.7 kJ

Chapter-3

- 3.1 24.05 kJ
3.3 0.878 bar, 30.57 K, 17.57 kJ, 0, 17.57 kJ
3.4 126.03 kJ/kg, 16.42 kJ/kg, 209.74°C, 107.13 kJ/kg
3.5 -2118 kJ, -176.5 kJ, -1941.5 kJ
3.6 $C_p = 1.008$ kJ/kgK, $C_v = 0.72$ kJ/kgK, 8.0263
3.7 377.5 kJ, 1.3, greater
3.9 (i) -515.86 kJ (ii) -34353.9 kJ
3.10 $A = -100$ kW, $B = 0$, $C = 400$ kW, $D = 500$ kW, $E = 600$ kW
3.11 478 kJ

Chapter-4

- 4.1 600 kJ/kg 4.2 778.44 m/s 4.3 471.6 kW 4.4 66.36 kW
4.5 -18.82 kW 4.6 2133.4 kW 4.7 -40 kW 4.8 179.58 kW
4.10 10 kW

Chapter-5

- 5.1 400 K 5.2 708 K, 475 K 5.6 0.6 kJ 5.7 2.85 kW
5.84.37°C 5.9 38.75°C 5.10 31%, No 5.11 -0.62 kW
5.12 29 kW 5.13 450 kW, 43.75%, 1.31, 0.7657 5.14 326.6 K, 86 kW
5.15 Rs 138.89

Chapter-6

- 6.1 $(\Delta S)_{surr} = -1.648$ kJ/K, $(\Delta S)_{sys} = 1.77$ kJ/K, $(\Delta S)_{univ} = 0.1226$ kJ/K
6.2 $(\Delta S)_{Al} = -4.04$ kJ/K, $(\Delta S)_{surr} = 5.914$ kJ/K, $(\Delta S)_{univ} = 1.874$ kJ/K
6.3 0.14 kJ/K
6.4 0.514 kJ/K

- 6.5 0.697 kJ/K, 0.199 kJ/K, -0.498 kJ/K, 0
 6.6 40%, 500 K
 6.8 10.2 kJ, 0.0078 kJ/K
 6.9 1321.5 kJ, 2.31 kJ/K
 6.10 -75.94 kJ/K, 75.94 kJ/K, 0

Chapter-7

- 7.1 0.0012165 m³/kg, 0.06668 m³/kg, 1008.4 kJ/kg, 2804.2 kJ/kg, 2.6457 kJ/kg-K, 6.1869 kJ/kg-K
 7.2 0.0014036 m³/kg, 0.02167 m³/kg, 1344 kJ/kg, 2749 kJ/kg, 3.2534 kJ/kg-K, 5.7045 kJ/kg-K
 7.3 0.05359 m³/kg, 2445.04 kJ/kg, 5.4787 kJ/kg-K
 7.4 $x = 0.727$
 7.5 151.9°C, 0.3749 m³/kg, 2748.7 kJ/kg, 6.8212 kJ/kg-K, 2108.5 kJ/kg
 7.6 0.03 m³/kg, 151.9°C, 0.077, 802.58 kJ/kg, 2.2427 kJ/kg-K
 7.7 233.9°C, 6.3404 kg, 0.00475 m³/kg, 1105.37 kJ/kg, 2.837 kJ/kg-K, 1091.16 kJ/kg
 7.8 204
 7.9 3.973 MPa, 8.3988 kg, 0.00355 m³/kg, 1166.06 kJ/kg, 2.947 kJ/kg-K, 1151.93 kJ/kg

Chapter-8

- 8.1 -40.04 kJ
 8.2 -0.0127 kJ/K, -3.66 kJ, -3.66 kJ
 8.3 64.25 kJ/kg, -0.1989 kJ/kg-K, 0, 25.5 kJ/K, 0
 8.4 0.95 kJ/K, 637.76 kJ, 0, 0, 0, 273.33 kJ, -0.95 kJ/K, -509.83 kJ, -145.6 kJ

Chapter-9

- 9.1 57.21%
 9.2 59%
 9.3 55.73%
 9.4 2 MPa, 706 K, 7.92 MPa, 2795 K, 0.395 MPa, 1187 K, 57.5%, 862.5 kJ/kg
 9.5 2683 kJ, 55.34%
 9.6 (a) 2520 kPa, (b) 607 kJ/kg, (c) 10
 9.7 1906 K, 605.5 kJ, 63.2%
 9.8 671.65 kJ/kg, 60%
 9.9 57.65%
 9.10 (a) 4.43 MPa, 2080.28 K, (b) 2.35, (c) 58.67%, (d) 704.04 kJ/kg

Chapter-10

- 10.1 33.5% 10.2 36.33% 10.3 25% 10.4 32.33%
 10.5 31.6%

Chapter-11

- 11.1 800 kg/m³, 1.6×10^{-3} N-s/m² 11.2 0.03125 N, 0.0078 W
 11.3 109.75 W 11.4 60 N

11.5 0.497 m/s

11.7 $\frac{\mu_1}{\mu_1 + \mu_2} h, \frac{h}{1 + \sqrt{\frac{\mu_2}{\mu_1}}}$

11.9 8.5 mm

11.11 7.467 N-s/m², 9.33×10^{-3} m²/s

11.13 4.24 mm

Chapter-12

- 12.1 49.46 kPa, 0.607 kg/m³
 12.3 $P_A - P_B = 549.36$ kPa
 12.5 $P_A - P_B = 1.24$ kPa
 12.7 49.457 kPa
 12.9 101.3 kPa, 1.22 kg/m³

Chapter-13

13.1 721, Laminar

13.3 (a) $\frac{x^3}{3} + y = \frac{7}{3}$, (b) $y^{1/3} = 4^{1/3} x^{1/4}$

13.5 $x^{1/4} y^{1/3} = 1$, $x^{1/4} z^{1/5} = 1$

13.7 $(x - y_0)y^2 - x_0 y_0 y + y_0^3 = 0$

13.9 0.1414 m³/s, 3.994 m/s

13.11 $\frac{2y}{x^2 + y^2}$

13.13 (a) Yes, (b) No, (iii) Yes

11.6 $T = \frac{4\pi\sigma\mu^4}{3h}$

11.8 148.93 N/m², 1.862 N-s/m²

11.10 47.1 N

11.12 $\frac{h\sqrt{\mu_1/\mu_2}}{1 + \sqrt{\mu_1/\mu_2}}$

11.14 14.6 kPa

12.2 77.36 kPa

12.4 $P_1 - P_2 = 103.79$ kPa

12.6 34.33 kPa(vac)

12.8 15.3 kN/m²

13.2 $2x - y = 0$

13.4 $x^2 y = \text{constant}$

13.6 $x^2 y = 2$, $4x + z = 5$

13.8 3.18 m/s, 5.66 m/s

13.10 (a) 4.05 m/s (b) 0.173 m³/s, 0.113 m³/s

13.12 $\frac{z^2}{2} - xz + f(x, y) + C$

Chapter-14

14.1 40.438 m

14.3 11.85 m

14.5 From Y to X

14.7 From Section 1 to 2, 1.065 m

14.9 0.0955 m³/s

14.11 1.039 m³/s

14.13 0.0134 m³/s, 1.09 m/s

14.15 8.08 m/s

14.17 0.066 m³/s

14.2 26.458 kN/m²

14.4 179.366 kN/m²

14.6 From A to B, 11.86 m of oil

14.8 0.0218 m³/s

14.10 0.0782 m³/s

14.12 26 cm

14.14 0.164 m³/s

14.16 3.1 m/s