Rješenja problema i zadataka za prvi razred

Modul 1

Problemi:

30. a) u $x = 4m$; b) C; c) B; d) $1m$; e) $9m$; f) C; g) A i C; h) C, nakon $4s$; i) A

31. pomak je nula a put je $8m$ **42.** d) **45.** D.

46. a) C, D; b) C, D; c) F; d) G; e) B; f) A,E **56.** b) **57.** d) **58.** drvena **66.** c)

Zadaci:

70. $\Delta s \equiv \Delta x = 45m$, $\Delta\vec{r} = -45m$ **71.** a) $s = 120m$; b) $\Delta x = 20m$

72. a) $s = 2000m$; b) $\Delta r = 707{,}1m$; c) $v_{sr} = 8{,}33m/s$ **73.** $\Delta r = 5m$, $s = 7m$

74. a) $\Delta r = 10m$, $s = 70m$; b) $\Delta r = 50m$, $s = 70m$

75. a) skica; b) $s = 1100km$, $\Delta r = 500km$ **76.** $\Delta v = 20m/s$ (prema sjeveru)

77. $s = 70{,}65m$, $\Delta r = 21{,}2m$ **78.** Uraditi tablicu i nacrtati graf **79.** $v = 4{,}2km/h$

80. $v = 4{,}2km/h$ **81.** $v_0 = 26m/s$ **82.** $v_{sr} = 8{,}33m/s$ **83. a)** $v_{sr} = 50km/h$; $v_{sr} = 48km/h$

84. a) $t = 0{,}56h$; b) $t' = 0{,}5h$; c) $t'' = 0{,}558h$ **85.** a) $v = 6m/s$; b) $v = 2m/s$; c) $v = 4{,}47m/s$

86. $v_{r.str.} = 0{,}5m/s$ **87.** $s \approx 1{,}43km$ **88.** $s = 12{,}5m$ **89.** $t = 8s$

90. a) prvih $5s$ jednoliko a nakon toga miruje; b) $v = 10m/s$ **91.** $v = 2m/s$

92. a) $v = 0{,}5m/s$; b) $s_0 = 2m$; c) $s = 4{,}5m$ **93.** a) $v_1 = 100m/h$, $v_2 = 0$, $v_3 = 40m/h$; b) $s = 38m$

94. a) jednoliko pravocrtno; b) $v_1 = v_2 = 1m/s$; c) $\Delta s = 4m$; d) ne može ($v_1 = v_2$)

95. Uraditi tablice i nacrtati grafove **96.** $a = 1m/s^2$ **97.** $v = 30m/s$ **98.** $v_{sr} = 10m/s$

99. $a = 3{,}56m/s^2$, $t = 22{,}47s$ **100.** $v\,(0 - 2s) = 1{,}5m/s$, $v\,(2s - 5s) = 0$, $v\,(5s - 8s) = 1m/s$

101. $s = \overset{br.}{P}_{\blacksquare} = 44m$, $v_{sr} = 5{,}5m/s$ **102.** $t = 4s$ **103.** $t_z = 40s$, $s_z = 320m$ **104.** $a = 0{,}67m/s^2$

105. $s = 30m$ **106.** a) $a = 1{,}67m/s^2$; b) $\Delta s = 6{,}375m$

107. a) $a = 4m/s^2$; b) $v = 32m/s$; c) $s = 18m$ **108.** $a = 3m/s^2$, $s = 37{,}5m$ **109.** $a = 2{,}5m/s^2$

110. $v = 32m/s$ **111.** $s = 200m$ **112.** a) $v = 3m/s$; b) $s = 6m$; c) $a = 1m/s^2$ (nacrtati a-t graf)

113. *i*) $s = 97{,}5m$, *ii*) $s = 20m$ **114.** a) $v = 20m/s$; b) $s_z = 100m$ **115.** $s = 40m$

116. a) $a = 2m/s^2$; b) $s = 25m$; c) v,t-graf **117.** $s_{10} = 26m$, $v = 2{,}6m/s$

118. $a_1 = 30km/h^2$, $a_2 = 0$, $a_3 = 10km/h^2 \Rightarrow a$-$t$ graf, $s = 101{,}25km$ **119.** $a = 1m/s^2$

120. $F = 0{,}5N$ **121.** $F = 420kN$ **122.** $F = 5N$ **123.** $a = 2m/s^2$ **124.** $F = 200N$

125. $F = 1{,}6kN$ **126.** $F = 3{,}25kN$ **127.** $F = -8N$ **128.** $F = 3{,}2kN$

129. a) $F_k = 4kN$; b) $t_z = 50s$; c) $s_z = 250m$ **130.** $v = 2m/s$

Modul 2

Problemi:

5. c) **8.** b) **12.** a) **13.** d) **14.** a) $F_R = 500N$; b) vektorski prikaz; c) $F_R = 0$

15. $F_R = 6{,}4N$ **16.** može (ako vektori čine jednakostranični trokut)

17. Zbrojiti vektore (pravilom mnogokuta) **21.** Razložiti vektor (pravilom paralelograma)

22. *i*) b) *ii*) c) **23.** $F_p \equiv G = 196{,}2N$, $F'_p < F_p$ **25.** b) **26.** a) **31.** d) **32.** b)

33. c) **35.** a) 2 puta; b) 2 puta; c) 4 puta **36.** b) **42.** $v_{č.k.} = v_č/2$

Zadaci:

49. d) **50.** $G = 392{,}4N$ **51.** $G = 981N$ **52.** c) **53.** c) **54.** $\Delta G = 33{,}35mN$

55. $G = 0$ **56.** $t = 0{,}8s$, $v = 7{,}89m/s$, $v_{sr} = 3{,}96m/s$ **57.** $\Delta h = 24{,}525m$ **58.** c)

59. a) $v_{sr} = 10m/s$; b) $h = 20{,}39m/s$; c) $h_{real.} < h$ **60.** $\Delta h = 44{,}145m$

61. a) $v = 20m/s$; b) $v_{sr} = 10m/s$ **62.** $F_{o.z.} = 0{,}981mN$ **63.** d) **64.** $k = 26{,}16N/m$

65. a) $k = 400N/m$; b) $l' = 7{,}5cm$; c) $l'' = 10cm$ **66.** a) $F_N = 19{,}62N$; b) $F'_N = 22{,}02N$ **67.** e)

68. c) **69.** $F_R = 100N$ **70.** $v = 2{,}77m/s$ **71.** $F_x = F_y = 14{,}14N$ **72.** $a = 1{,}338m/s^2$

73. $F_{g1} = 3{,}7N$, $F_p \equiv F_{g1} = 9{,}285N$ **74.** $a = 3{,}64m/s^2$, $t = 1{,}088s$ **75.** e) **76.** $a = 1{,}175m/s^2$

77. $F_{tr} = 133{,}33N$ **78.** b) **79.** $v_0 = 6m/s$ **80.** $F_{tr} = 30kN$ **81.** $d_{min} \equiv s_z = 50m$

82. $m_1 = 1kg$ **83.** $\mu = 0{,}034$ **84.** a) $F_v = 981N$; b) $F'_v = 2981N$ **85.** a) **86.** a)

87. $F = 11{,}8kN$ **88.** a) $F_{4,5} = 7{,}063kN$; b) $F'_{4,5} = 103kN$ **89.** $v = 8m/s$ **90.** $t \approx 2{,}5s$

91. a) **92.** $\mu = 1$ **93.** $v = 13{,}3m/s$ **94.** $F_{g1} = 0{,}53N$, $F_{tr} = 0,\ 04N$, $a = 4{,}9m/s^2$

95. a) $a = 5m/s^2$; b) $m = 80kg$ **96.** $F = 80N$ **97.** $F_{sr} = 360kN$ **98.** $F_{sr} = 200N$ **99.** d)

100. $I = 2{,}84 \cdot 10^{-23}Ns$ **101.** d) **102.** $v = 5m/s$ **103.** $v_d = -0{,}8m/s$ **104.** $v_2 = 0{,}27m/s$

105. d) **106.** $v = 2{,}6m/s$ **107.** a) **108.** a) E); b) E) **109.** $v = 5{,}086km/h$

110. $v = 1{,}77km/h$ **111.** $v'_2 = 1{,}5m/s$ **112.** $v_2 = 3{,}2m/s$ **113.** $m_2 = 20000t$

114. $v_1 = -18m/s$ **115.** $v_2 = -12{,}5m/s$ **116.** $v'_2 = 2m/s$

Modul 3

Problemi:

1. b) $\vec{v}_A \neq \vec{v}_B \neq \cdots$ **4.** a) **8.** a) **9.** d) **17.** c) **18.** $v_{rel.}(M) = 12m/s,\ v_{rel.}(A) = 9m/s$

19. a) $v_b = 16km/h$; b) $v_r = 4km/h$ **21.** d) **22.** c) **23.** d) **26.** b) **28.** $D' = 2D$

34. $D' = 4D$ **42.** b) **43.** c) **45.** $F_{cp} = F_g - F_p$ **46.** $F_{cp} = F_p - F_g$ **51.** a) **54.** c)

55. a) **59.** $h = 2R_Z$ **60.** a)

Zadaci:

66. $r_1 = 6cm$ **67.** $v_h : v_{min} = 1 : 16$ **68.** b) **69.** c) **70.** $F_{cp} = 1{,}6kN$ **71.** a)

72. $F_{cp} = 50mN$ **73.** $t = 100s,\ s = 50m$ **74.** c) **75.** $v_{r.str.} = 0{,}5m/s$

76. a) $v_{č} = 5m/s,\ v_r = 2m/s$; b) $v = 5{,}385m/s$ **77.** $v_{č} = 2{,}7m/s$ **78.** $t_p = 5s,\ h_{max} = 125m$

79. $h_{max} = 490{,}5m$ **80.** a) $h_{max} = 30{,}6m$; b) $v = v_0 = 24{,}5m/s$ **81.** $v = 24{,}85m/s$ **82.** d)

83. $D = 180{,}8m$ **84.** $v_0 = 31{,}97m/s$ **85.** a) $t_p = 3{,}19s$; b) $D = 95{,}7m$ **86.** $D = 234{,}6m$

87. $\Delta t = t_p = 6{,}385s$ **88.** $h = 35{,}6m$ **89.** $v_0 = 4{,}39m/s,\ t_p = 6{,}3855s$

90. $D = 4{,}455m < d\ (6{,}2m)$ **91.** $v = 17{,}2m/s$

92. a) $x = 2000m,\ -y = 19{,}62m,\ v = 1000{,}19m/s$; b) $v_k = 1000{,}98m/s$; c) $t_1 = 3{,}78s$ **93.** b)

94. a) $v_{0x} = 50m/s,\ v_{0y} = 86{,}5m/s$; b) $x = 100m,\ y = 153{,}38m$; c) $h_{max} = 381{,}36s,\ t_p = 8{,}82s$

95. a) $r = 133{,}37m$; b) $v = 43{,}48m/s$; c) $D = 220{,}44m$ **96.** $h \geq y = 162{,}07m$ **97.** $a_s = 0{,}98m/s^2$

98. $G_d = 663{,}85N$ **99.** e) **100.** $\Delta l = 30{,}7cm$ **101.** b)

102. a) $G_d = 981N$; b) $G_d = 981N$; c) $G_d = 1181N$; d) $G_d = 781N$; e) $G_d = 0$ **103.** $\mu_{min} = 0{,}51$

104. e) **105.** $v_{min} = 2{,}74m/s$ **106.** $F_N = 1{,}095N$ **107.** e)

108. *i*) $v = 35m/s,$ *ii*) $F'_p = 14712N$ **109.** $v_{max} = 15{,}77m/s$ **110.** $F_N = 12N$

111. $F = 3{,}914 \cdot 10^{-4}N$ **112.** $r_1 = r_2 \equiv r = 8{,}65cm,\ m_1 = m_2 \equiv m = 21{,}2kg$ **113.** $d = 3m$

114. $d = 54R_Z$ **115.** d) **116.** d) **117.** $F_{gM} = 0{,}165F_{gZ}$

118. $M_S = 2{,}024 \cdot 10^{30}kg$ **119.** $M_Z = 6{,}02 \cdot 10^{24}kg$ **120.** $M_Z = 5{,}6 \cdot 10^{24}kg$

121. $g(h) = 9{,}6m/s^2$ **122.** $\rho = 18{,}9kg/m^3$ **123.** b) **124.** $v = 3{,}066km/s$

125. $r = 42400km$ **126.** $T = 1{,}719h$ **127.** $v = 1{,}673km/s$ **128.** $T_1 = 7{,}694h,\ T_2 = 30{,}92h$

Modul 4

Problemi:

9. $W_{b)} > W_{c)}$ **12.** c) **13.** $W_{a)} > 0,\ W_{b)} = 0,\ W_{c)} < 0$ **22.** $E'_k = 2E_k$ **23.** $E'_k = 9E_k$

31. a) **32.** c) **33.** b) **38.** $W = \overset{br.}{P_{\blacktriangle}} = 0{,}04J$ **39.** b)

40. $E_p = 49{,}05J,\ E_k = 49{,}05J$ **42.** c) **43.** e) **44.** a) A i B; b) A i B; c) C

45. a) C; b) E **47.** c) **52.** e) **53.** c) **55.** c)

Zadaci:

56. $W = 36J$ **57.** $W = 3139{,}2J$ **58.** c) **59.** $W = 0{,}7J$ **60.** $W = 2419{,}08J$

61. $W = 0$ **62.** $W = 29{,}43kJ,\ W_{ul} = 34{,}62kJ$ **63.** $\eta(\%) = 75\%$ **64.** $\eta(\%) = 60\%$

65. a) A); b) B) **66.** $P_{sr} = 30kW$ **67.** c) **68.** $P_{min} = 27{,}3kW$ **69.** b)

70. $P = 175{,}18kW$ **71.** $P = 4{,}51kW$ **72.** $\eta = 0,\ 8175$ **73.** $v_1 : v_2 = 1 : 3$ **74.** c)

75. d) **76.** $E_k = 51{,}2J$ **77.** $\Delta E_{gp} = 40{,}466kJ$ **78.** b) **79.** a) $W = 480J$; b) $v = 3{,}4m/s$

80. c) **81.** $W \approx 927J$ **82.** $W_{tr} = 80{,}22J$ **83.** c) **84.** c) **85.** $W = 4{,}5J,\ W_{el.} = -4{,}5J$

86. $E_{ep} = 2J$ **87.** a) **88.** $W_{el} = 31{,}1J$ **89.** c) **90.** $v = 40{,}25m/s,\ h_{max} = 82{,}57m$

91. $P = 6{,}25W$ **92.** $W_{tr,o.z.}/E_{gp}\,(\%) = 89{,}8\%$ **93.** $W_{o.z.} = 669{,}6J$ **94.** $F_{sr} = 0{,}16MN$

95. c) **96.** $W_{tr} = 312{,}5J$ **97.** a) **98.** $F_{sr} = 1{,}34kN$ **99.** c) **100.** d)

101. $E_k = 19{,}95J$ **102.** $h = 0{,}2m$ **103.** $v = 5{,}43m/s$ **104.** a) $v = 7{,}9m/s$; b) $F_{sr} = 4708{,}8N$

105. $h_{min} = 2{,}5r$ **106.** $W_{o.z.} = 3348J$ **107.** $W \equiv \Delta E_k = 6kJ$ **108.** $W_{o.z.} = 815{,}2kJ$

109. e) **110.** $s_z = 1{,}19m$ **111.** a) $E_{gp} = 1kJ$; b) $W_{o.z.} = 190J$ **112.** c)

113. a) $E_{kD} = 20J$; b) $E_D = 30J$ **114.** $m_2 = 2m_1$

Modul 5

Problemi:

8. a) **12.** u posudi A, p_h je isti u svim posudama, najveća F je u posudi C **13.** d) **14.** c)
18. a) **34.** c) **39.** b) **40.** b) **41.** a) **42.** Ravnoteža se poremeti utjecajem F_u
58. c)

Zadaci:

59. $F = 1{,}013 \cdot 10^7 N$, krov se ne ruši jer ista sila (tlak) djeluje ispod krova u suprotnome smjeru
60. $p = 3{,}024 \cdot 10^7 Pa$ **61.** $p = 8{,}068 \cdot 10^5 Pa$ **62.** $h = 5{,}09 m$ **63.** $F = 353{,}16 N$
64. a) $p = 8 kPa$; b) $F_{min} = 16 N$ **65.** $p = 108976{,}8 Pa$ **66.** $F = 6{,}16 N$ **67.** $F = 38{,}8 N$
68. $F_{min} = 24{,}53 N$ **69.** $p = 2{,}516 \cdot 10^5 Pa$, $F = 428{,}4 N$ **70.** $p \geq 15892{,}2 Pa$
71. $p = 75{,}82 kPa$ **72.** $h = 15{,}87 cm$ **73.** $\rho_f = 4800 kg/m^3$ **74.** $F_{uAu} = 0{,}43 N$
75. $\rho_f = \rho = 854 kg/m^3$ **76.** $F_u = 0{,}64 N$ **77.** $\rho = 750 kg/m^3$ **78.** $F_u = 9{,}81 N$
79. $m_t = 45 kg$ **80.** $V_{izr.} = 0{,}105 V$ **81.** $V = 600 m^3$ **82.** $V_{izr.} = 0{,}2 V$ **83.** $G_f = 0{,}39 N$
84. $G_v = 6{,}3 N$ **85.** $F_u = 0{,}123 N$, $G_v = 0{,}858 N$ **86.** $\rho = 1500 kg/m^3$ **87.** $\rho = 7250 kg/m^3$
88. $G_z = 66{,}67 N$ **89.** $\rho = 2{,}5 \cdot 10^3 kg/m^3$ **90.** $V_u = 3{,}3 \cdot 10^{-4} m^3$ **91.** $v_1 = 0{,}5 m/s$, $v_2 = 2 m/s$
92. $q = 0{,}0174 m^3/s$, $v = 13{,}85 cm/s$ **93.** d) **94.** $v_1 / v_2 = 2{,}87$ **95.** $v_1 / v_2 = 0{,}785$
96. $t = 1 h$ **97.** $d \equiv 2r = 2{,}06 cm$ **98.** $q = 0{,}83 L/s$, $v = 2{,}64 m/s$ **99.** $h = 6{,}58 m$, $v = 11{,}36 m/s$
100. $d_2 = 1{,}87 cm$ **101.** $\Delta p = 1875 Pa$ **102.** $q = 816 L/s$ **103.** $p_1 = 1{,}131 MPa$
104. $h = 36{,}7 cm$ **105.** $D = 1{,}413 m$ **106.** $v_2 = 2 m/s$, $p_2 = 103{,}8 kPa$

Antonija Topić, prof.

Matea Dugandžić, prof.