

Exercise-I

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|-------|-------|-------|-------|-------|-------|
| 1. A | 2. C | 3. B | 4. D | 5. C | 6. C |
| 7. A | 8. B | 9. D | 10. B | 11. B | 12. C |
| 13. A | 14. C | 15. C | 16. C | 17. D | 18. B |
| 19. B | 20. B | 21. D | 22. B | 23. C | 24. A |
| 25. A | 26. B | 27. C | 28. B | 29. A | 30. C |
| 31. C | 32. D | 33. C | 34. B | 35. B | 36. C |
| 37. C | 38. B | 39. D | 40. A | 41. B | 42. A |
| 43. D | 44. B | 45. B | 46. C | 47. C | 48. B |
| 49. B | 50. B | 51. D | 52. C | 53. B | 54. D |
| 55. A | 56. B | 57. D | 58. C | 59. C | 60. A |
| 61. C | 62. B | 63. B | 64. D | 65. D | 66. C |
| 67. A | 68. C | 69. C | 70. A | 71. D | 72. C |
| 73. A | 74. D | 75. C | 76. B | 77. D | |

Exercise-II

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|------------|-----------|-----------|-----------|-----------|-------------|
| 1. A,B,C,D | 2. B,C | 3. A,D | 4. B,C,D | 5. A,B,D | 6. A,B,C |
| 7. A,C,D | 8. B | 9. A,C,D | 10. A,C,D | 11. C | 12. B,C,D |
| 13. A | 14. C | 15. B,C | 16. A,C | 17. B,C | 18. A,B,C,D |
| 19. B,D | 20. A,B,C | 21. A,B,C | 22. C | 23. B,C,D | 24. A,C,D |
| 25. A,B,D | | | | | |

Exercise-III

1. $\frac{MR^2}{2} - M\left(\frac{4R}{3\pi}\right)^2$ 2. $\frac{14mr^2}{5}$ 3. $\sqrt{2}r$ 4. $\frac{Ml^2}{2}$ 5. $2mR^2$
6. $w \ell \sin \theta$, when the bob is at the lowest point 7. $-14\hat{i} + 10\hat{j} - 9\hat{k}$
8. $P = \frac{mg}{2} \cot \theta$ 9. $\frac{3Ft^2}{2m\ell}$
10. (a) $\frac{3g}{4L}$ (cw) (b) $N = \frac{13mg}{16} \uparrow, F = \left(\frac{3\sqrt{3}}{16}\right)mg \rightarrow$ (c) $\frac{3\sqrt{3}}{16}$
11. $\frac{2g}{5} \downarrow$ 12. $w = \sqrt{5} \text{ rad/s}$ 13. at a distance $a/2\sqrt{3}$ from the centre down the plane.
14. 12 gm 15. $\frac{100}{\sqrt{3}} \text{ N}$ 16. 13 W / 12 17. $\frac{R^2 \omega^2}{4g}$ 18. 2.1 rad/s² 19. $15\sqrt{2} \text{ sec}$
20. 48 21. gr/bh 22. $\frac{mg\ell}{8}$ 23. 2 24. (i) 10/13 m/s², (ii) 5000/26 π , (iii) 480/13 N

25. $M = 2m \left(\frac{2gh}{R^2 \omega^2} - 1 \right)$ 26. $16 \text{ kg m}^2/\text{s}$ 27. $2\hat{k} \text{ kg m}^2/\text{s}$ 28. $0.5 \text{ kg} - \text{m}^2/\text{s}, 75 \text{ J}$
29. 19.7 rad/s 30. 60° east of south, 30° south of east. 31. $(1/2)KE_0$ 32. $\frac{\omega}{3}$
33. 120 34. $\frac{7}{10}mv^2$ 35. 50 m/s 36. $\sqrt{\frac{10gh}{7}}$ 37. $\sqrt{\frac{10}{7}}g\ell \sin\theta$ 38. $\frac{17}{7}mg$
39. $\frac{v_0}{3}(\leftarrow), \frac{2v_0}{3}(\rightarrow)$ 40. (a) $\frac{Ft}{m}$ (b) $\frac{6Ft}{m\ell}$ (c) $\frac{2F^2t^2}{m}$ (d) $\frac{F\ell t}{2}$ 41. $\frac{13}{16}Mv^2$ 42. $\frac{3}{4}MR^2$

Exercise-IV

1. $2mg$ 2. 3 3. $2F/M$ 4. 2m/s 5. $1/2 \text{ ma}$ 6. $v = \sqrt{\frac{14gR}{3}}$
7. $a = \left[\frac{b - \mu a}{3b + \mu a} \right] g$ 8. $F_{\text{dlx}} = \frac{3mgw}{2h}$ and $F_{\text{duy}} = mg$ 9. $57/140 MR^2$ 10. (a) $\frac{9g}{7} \downarrow$ (b) $\frac{4mg}{7} \uparrow$
11. (a) $\frac{3\rho_0 a}{2}$ (b) $\frac{5a}{9}$, (c) $\frac{7a^3 \rho_0}{12}$, (d) $\frac{18P}{7Ma}$, (e) $\frac{M}{9}\sqrt{70ag}$ 12. $300 \text{ rad/sec}, 150 \text{ rad/sec}$
13. $t = 2/\sqrt{5} \text{ sec}$, $q = 4p/5 \text{ rad}$ 14. 16 m/s^2 15. $v = \sqrt{\frac{27}{7}}gR$ 16. (a) $4\sqrt{\frac{3}{7}}\text{m/s}$, (b) $\frac{200}{7}\text{N}$
17. $-\frac{1}{15}v_0$ 18. 210 19. $1.63 \text{ N}, 1.224 \text{ m}$

Exercise-V

1. A 2. A, B, C 3. $v = \sqrt{5gR}$ 4. A 5. C 6. C
7. $a_c = \frac{4F}{(3m_1 + 8m_2)}$, $a_p = \frac{8F}{(3m_1 + 8m_2)}$, $f_1 = \frac{3m_1 F}{(3m_1 + 8m_2)}$, $f_2 = \frac{m_1 F}{(3m_1 + 8m_2)}$
8. C 9. D 10. B
11. (a) $\frac{m}{M} = \frac{1}{4}$; (b) $x = \frac{2L}{3}$; (c) $\frac{v_0}{2\sqrt{2}}$
12. (a) $1 = 0.1\text{m}$; (b) $w' = 1 \text{ rad/s}$; (c) laminar sheet will never come to rest
13. A 14. (a) $\sqrt{3} \text{ m } \omega^2 l$, (b) $F_x = F/4$, $F_y = \sqrt{3} \text{ m } \omega^2 l$
15. A 16. A 17. A 18. B 19. C 20. B
21. B 22. $\omega = \frac{3mv}{(3m + M)L}$ 23. $a_{\text{axis}} = \frac{2g\sin\theta}{3}$
24. $f = (M + m)g \frac{\cot\theta}{2}$ 25. A 26. C, D 27. A, B 28. 10m/s
29. C 30. A 31. B 32. D 33. D
34. D 35. A 36. B, C
37. 0004 38. B 39. C 40. 0003 41. C 42. A 43. D
44. A, B 45. D