Section A (60 points)

1. C	2. E	3. B	4. A, C, D	5. B
6. B	7. A	8. C	9. E	10. B
11. E	12. E	13. D	14. A	15. A
16. D	17. D	18. D	19. B	20. C
21. A	22. D	23. C	24. B	25. E
26. B	27. D	28. D	29. C	30. D

Section B (90 points)

1. (a) $(\pi D)/(2P)$
   (b) $(2P(m+M)g)/(\pi^2 D^2 k)$
   (c) Decrease, because D increases which increases both the IMA and the rope's elongation (which increases the applied force).

2. (a) $\cot(\theta/2)/2$
   (b) $(M^2V^2)/(2(m+M)D)$
   (c) $(Md)/((m+M)D)$
   (d) Sound

3. Rubric outlined in solutions.

4. (a) i. 3.33 and 0.3
      ii. 5.49 N
   (b) i. 0.594 N m
      ii. 0.174 kg
   (c) i. 50 s
      ii. 40.9

5. (a) i. 5 or 1/5
      ii. $M_{max} = 163\,\text{kg}$ and $M_{min} = 42.5\,\text{kg}$
      iii. 26.6 m
   (b) i. Class 2 lever
      ii. $\theta_{min} = 16.5°$ and $\theta_{max} = 163.5°$
      iii. $\theta_{min}(\lambda) = \sin^{-1}(4.25\,\text{kg}\,\text{m}^{-1} \cdot \lambda^{-1})$ for $\lambda \in [4.25, \infty)\text{kg}\,\text{m}^{-1}$