1. (b) $RC = T$

$\because\ [R] = [ML^2T^{-3}I^{-2}]$ and $[C] = [M^{-1}L^{-2}T^4I^2]$

2. (b) $v \propto g^p h^q$ (given)

By substituting the dimension of each quantity and comparing the powers in both sides we get $[LT^{-1}] = [LT^{-2}]^p[L]^q$

$\Rightarrow\ p + q = 1,\ -2p = -1, \therefore\ p = \frac{1}{2}, q = \frac{1}{2}$

3. (c) Both are the formula of energy . $\left(E = \frac{1}{2}CV^2 = \frac{1}{2}LI^2\right)$

4. (c)

5. (c) Dimensions of power is $[ML^2T^{-3}]$

6. (a) $\frac{\text{Angular momentum}}{\text{Linear momentum}} = \frac{mvr}{mv} = r = [M^0L^1T^0]$

7. (b, c)

8. (a) Angle of banking : $\tan\theta = \frac{v^2}{rg}$. *i.e.* $\frac{v^2}{rg}$ is dimensionless.

9. (b) Solar constant is energy received per unit area per unit time *i.e.* $\frac{[ML^2T^{-2}]}{[L^2][T]} = [M^1T^{-3}]$

10. (a) Let $T \propto S^x r^y \rho^z$

by substituting the dimension of $[T] = [T]$

$[S] = [MT^{-2}], [r] = [L], [\rho] = [ML^{-3}]$

and by comparing the power of both the sides

$x = -1/2, y = 3/2, z = 1/2$

so $T \propto \sqrt{\rho r^3 / S} \Rightarrow T = k\sqrt{\frac{\rho r^3}{S}}$

11. (a) Resistivity $[\rho] = \frac{[R].[A]}{[l]}$ where $[R] = [ML^2T^{-1}Q^{-2}]$

$\therefore\ [\rho] = [ML^3T^{-1}Q^{-2}]$

12. (c) Torque = $[ML^2T^{-2}]$, Angular momentum = $[ML^2T^{-1}]$ So mass and length have the same dimensions

13. (b)

14. (c) Angular momentum = $[ML^2T^{-1}]$, Frequency = $[T^{-1}]$

15. (a)

16. (d) $F \propto v \Rightarrow F = kv \Rightarrow [k] = \left[\frac{F}{v}\right] = \left[\frac{MLT^{-2}}{LT^{-1}}\right] = [MT^{-1}]$

17. (b) $R = \frac{V}{I} = \left[\frac{ML^2T^{-3}A^{-1}}{A}\right] = [ML^2T^{-3}A^{-2}]$

18. (a) Let $n = k\rho^a a^b T^c$ where $[\rho] = [ML^{-3}], [a] = [L]$ and $[T] = [MT^{-2}]$

Comparing both sides, we get

$a = \frac{1}{2}, b = \frac{3}{2}$ and $c = \frac{-1}{2}$ $\therefore\ \eta = \frac{k\rho^{1/2}a^{3/2}}{\sqrt{T}}$

19. (c) L/R is a time constant so $(R/L) = T^{-1}$

20. (c) Shear modulus = $\frac{\text{Shearing stress}}{\text{Shearing strain}} = \frac{F}{A\theta} = [ML^{-1}T^{-2}]$