

## Assignment - 2

### Application of ordinary differential Equation.

- 2] A paratrooper & his parachute weigh 50 kg at the instant parachute opens he is travelling vertically upward downward but speed 20 m/s. if the air resistance varies directly as instantaneous velocity and it is 20 newton when velocity is 10 m/s Find the velocity of paratrooper as any time  $t$  the position & limiting velocity.

→ mass  $m = 50 \text{ kg}$   
initial velocity  $v_0 = 20 \text{ m/s} \downarrow$

Air resistance  $F = kv$

$$v = 10 \text{ m/s} \quad F = 20 \text{ N}$$

$$k = 20/10 = 2 \text{ N s/m}$$

$$\text{gravity } g = 9.8 \text{ m/s}^2$$

equation of motion

$$m \frac{dv}{dt} = mg - kv = \frac{dv}{dt} = 9.8 - 0.04v$$

$$\left( \text{since } k/m = 2/50 = 0.04 \right)$$

(2) velocity at any time  $t$

$$v(t) = 245 - 225e^{-0.04t}$$

(3) position at any time  $t$ :

$$x(t) = 245t + 5625(e^{-0.04t} - 1)$$

limiting velocity (as  $t \rightarrow \infty$ ):

$$v = 245 \text{ m/s}$$