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DEPT: COMPUTER ENGINEERING

MATRIC NO: 19/ENG02/079

COURSE: ENGINEERING MECHANICS

HOLIDAY ASSIGNMENT ANSWER

1.  $V = (4t - 3t^2) \text{ m/s}$   $t=0, s=0, t=4$

$$V = ds/dt = (4t - 3t^2)$$

Therefore  $ds/dt = (4t - 3t^2)$

$$S ds = S^4 (4t - 3t^2) dt$$

$$S = [4t^2/2 - 3t^3/3]_{t=0}^{t=4}$$

$$S = [2t^2 - t^3]_{t=0}^{t=4}$$

Therefore  $S = [2t^2 - t^3]_{t=0}^{t=4} - [2t^2 - t^3]_{t=0}$

$$S = 2(4)^2 - (4)^3 - [0]$$

$S = -32\text{m}$  therefore  $S = 32\text{m}$

That means the position of the particle is to the left of the origin.

2.  $V = (0.5t^3 - 8t) \text{ m/s}$ ,  $t = 2 \text{ s}$ ,  $a = ?$

$$a = dv/dt$$

$$a = d/dt (0.5t^3 - 8t)$$

$$\text{at } t = 2 \text{ s}$$

$$= 1.5(2)^2 - 8$$

$$= (1.5 \times 4) - 8 = -2 \text{ m/s}^2$$

Therefore this implies that the particle is decelerating

3.  $a = (4t^2 - 2)$

$$a = dv/dt = (4t^2 - 2)$$

$$dv/dt = (4t^2 - 2)$$

$$\int dv = \int (4t^2 - 2) dt$$

$$V = (4t^3/3 - 2t + C_1) \text{ m/s}$$

Therefore  $V=ds/dt=(4t^3/3-2t+C_1)m/s$

$$Ds/dt=(4/3t^3-2t+C_1)$$

$$Sds=S(4/3t^3-2t+C_1)dt$$

$$S=(4t^4/3-2t^2/2+c_1t +c_2)m$$

$$S=1/3t^4-t^2+c_1t +c_2$$

$$\text{At } t=0s \quad S=-2m$$

$$-2=1/3t^4-t^2+c_1t+c_2$$

$$-2=1/3(0)^4-(0)^2+(1(0))+c_2$$

Therefore  $c_2=-2$

$$\text{At } t=2, S=-20m$$

$$S=1/3t^4-t^2+c_1t-2$$

$$-20=1/3(2)^4-(2)^2+c_1(2)-2$$

$$-20 = 16/3 - 4 + 2c_1 - 2$$

$$-20 = -2/3 + 2c_1$$

$$2c_1 = -20 + 2/3$$

$$2c_1 = -19.33$$

$$c_1 = -19.33/2 = -9.67$$

Therefore  $c_1 = -9.67$

$$c_2 = -2$$

Therefore  $S = 1/3t^4 - t^2 + c_1t + c_2$

$$S = 1/3t^4 - t^2 - 9.67t - 2$$

At  $t = 4s$   $S = ?$

$$S = 1/3(4)^4 - (4)^2 - 9.67(4) - 2$$

$$S = 256/3 - 16 - 38.668 - 2$$

$$S=0.56/3-56668$$

$S=28.667\text{m}$  Therefore the position of the particles is  $28.67\text{m}$

$$4. \quad V = (20 - 0.055^2)$$

$$a = dv/dt = dv/ds \times ds/dt$$

$$= dv/ds \times v$$

Therefore

$$a = V dv/ds$$

$$dv/ds = -0.15$$

Therefore

$$a = (20 - 0.055^2) (-0.15)$$

at  $S=15\text{m}$

$$a = (20 - 0.05(15)^2) (-0.1(15))$$

$$a = (20 - 11.25) (-1.5)$$

$$a = (8.75) (-1.5)$$

$$a = 13.125 \text{m/s}^2$$

$$a = -13.1 \text{m/s}^2$$

Therefore the acceleration of the particle at  $S=18\text{m}$  is due  $-13.125\text{m/s}^2$  which implies that the particles is decelerating.