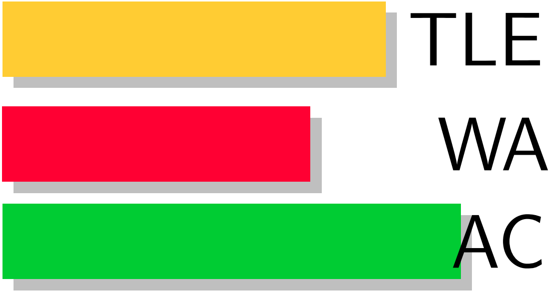
0주차 - X, X

2016 이산구조



gs1XXXX(XX기 XXX)

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1.1

관성계 : 절대 좌표계 (x, y, z)

비관성계 : 회전좌표계 (x', y', z') 극좌표 (r, θ, z)

$(x, y, z) \to (r, \theta, z)$

수평 방향은 정역학 평형 상태에 있으므로, $(x, y) \to (r, \theta)$

$\vec{F} = F_x \hat{i} + F_y \hat{j}$

$F_x = m\dfrac{d^2x}{dt^2}$, $F_y = m\dfrac{d^2y}{dt^2}$

$(x, y) = (r\cos\theta, r\sin\theta)$

$$F_r = F_x \cos\theta + F_y \sin\theta = m\left(\frac{d^2x}{dt^2}\cos\theta + \frac{d^2y}{dt^2}\sin\theta\right)$$

$$F_\theta = F_y \cos\theta - F_x \cos\theta = m\left(\frac{d^2y}{dt^2}\cos\theta - \frac{d^2x}{dt^2}\cos\theta\right)$$

1.2

$$x = r\cos\theta,\ \frac{dx}{dt} = \cos\theta\frac{dr}{dt} - r\sin\theta\frac{d\theta}{dt},$$
$$\frac{d^2x}{dt^2} = \cos\theta\frac{d^2r}{dt^2} - \sin\theta\frac{dr}{dt} - \sin\theta\frac{dr}{dt}\frac{d\theta}{dt} - r\cos\theta\frac{d^2\theta}{dt^2}$$
$$y = r\sin\theta,\ \frac{dy}{dt} = \sin\theta\frac{dr}{dt} + r\cos\theta\frac{d\theta}{dt},$$
$$\frac{d^2t}{dt^2} = \sin\theta\frac{d^2r}{dt^2} + \cos\theta\frac{dr}{dt} + \cos\theta\frac{dr}{dt}\frac{d\theta}{dt} - r\sin\theta\frac{d^2\theta}{dt^2}$$

정리하면,

$$F_r = m\left[\frac{d^2r}{dt^2} - r\left(\frac{d\theta}{dt}\right)^2\right]$$
$$F_\theta = m\left[r\frac{d^2\theta}{dt^2} + 2\frac{dr}{dt}\frac{d\theta}{dt}\right]$$

1.3

$$\frac{d\theta}{dt} = \Omega,\ r\frac{d\theta}{dt} = r\Omega,\ u_\theta,\ \frac{dr}{dt} = v_r$$

$$\frac{d}{dt} r^2\Omega = 2r\frac{dr}{dt}\Omega + r^2\frac{d\Omega}{dt}$$

$$= \mathrm{r}\left(r\frac{d\Omega}{dt} + 2\frac{dr}{dt}\Omega\right)$$

$$rF_\theta = m\frac{d}{dt}\left(r^2\Omega\right)\ r^2\Omega = const$$

$$r\left(r\Omega\right) = ru_\theta = const$$

$$R_1 v_1 = R_2 v_2$$

1.4

$dV = dx \cdot dy \cdot dz$

x 방향

$F_x = P \cdot \Delta y \cdot \Delta z - (P + \Delta P)\, \Delta y \cdot \Delta z$

$F_x = -\Delta P \cdot \Delta y \cdot \Delta z$

$$\frac{\Delta y}{\Delta x} = \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

$$f'(x) = lim \frac{\Delta y}{\Delta x} = \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

$z = f(x, y),\ y = b(\breve{\ })\ //$

$$\frac{\partial z}{\partial x} = lim \frac{\Delta z}{\Delta x} = \frac{f(x + \Delta x, b) - f(x, b)}{\Delta x}$$

$$\frac{\partial z}{\partial y} = lim \frac{\Delta z}{\Delta y} = \frac{f(y + \Delta y, b) - f(y, b)}{\Delta y}$$

$$\Delta z = \frac{\partial z}{\partial x} \Delta x + \frac{\partial z}{\partial y} \Delta y$$

$$dz = \frac{\partial z}{\partial x} dx + \frac{\partial z}{\partial y} dy$$

1.5

$$\Delta T = \frac{\partial T}{\partial t}\Delta t + \frac{\partial T}{\partial x}\Delta x + \frac{\partial T}{\partial y}\Delta y + \frac{\partial T}{\partial z}\Delta z$$

$$F_x = -\Delta P \cdot \Delta y \cdot \Delta z = \frac{\partial P}{\partial x} \cdot \Delta x \cdot \Delta y \cdot \Delta z$$

$$\rho = \frac{m}{\Delta x \cdot \Delta y \cdot \Delta z}$$

$$\frac{F_x}{m} = -\frac{1}{\rho}\frac{\partial P}{\partial x}$$

$$\frac{F}{m} = -\frac{1}{\rho}\left(\frac{\partial P}{\partial x} i + \frac{\partial P}{\partial y} j + \frac{\partial P}{\partial z} k\right) = -\frac{1}{\rho}\nabla P$$

4

asdf

Lorem Ipsum Dolor Sit Amet