UNIVERSIDAD DE SAN CARLOS DE GUATEMALA
FACULTAD DE INGENIERIA
ESCUELA DE CIENCIAS
DEPARTAMENTO DE FISICA
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EXAMEN FINAL DE FISICA 1

REG. ACADEMICO: 202100081 **CUI:** 3020696740101

NOMBRE: Javier Andrés Monjes Solórzano **FIRMA:**

CATEDRÁTICO: Eddy Josué Solares Espinoza **SECCIÓN:** E-

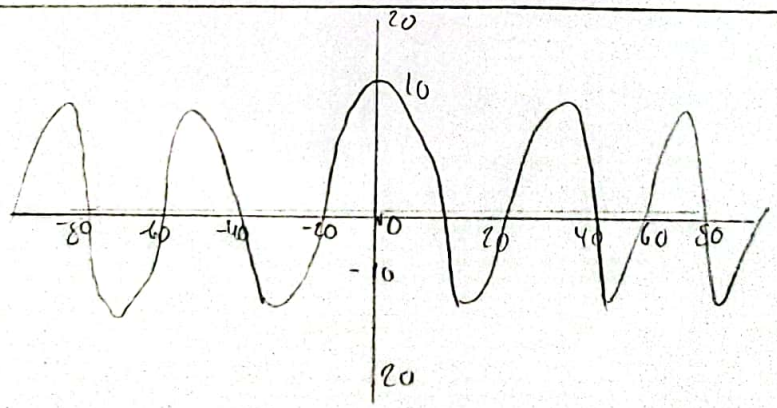
Pregunta No. 1

$t = 0.0s \rightarrow +x$

$30.0Hertz \Rightarrow f$

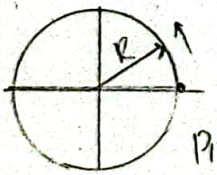
Vonda = ?

$y = A\cos(k(x \pm vt))$



$V = \frac{\lambda}{T} = \lambda \cdot f \rightarrow V = (40cm)(30\,1/s) \rightarrow V = 120cm/s \times 1cm/100cm \rightarrow V = 1,2m/s$

1.2m/s



$P_1 \rightarrow M.C.U \rightarrow \omega = 10 rad/s$

$P_2 \rightarrow Reposo \rightarrow \alpha = 1 rad/s^2$

Pregunta 2

Vueltas de P_2 cuando alcance a P_1

$P_1 \rightarrow \theta = \theta_0 + \omega t$; Sabido $\theta_0 = 0$; $\theta_1(t) = 10t$

$P_2 \rightarrow \theta_2(t) = \theta_0^0 + \omega_{02} t + \frac{1}{2}\alpha t^2$; $\theta_0 = 0 \rightarrow \theta_2(t) = \omega_{02} t + \frac{1}{2}\alpha t^2$; $\omega_{02} = 0$

$\theta_2(t) = \frac{1}{2}(10)t^2 = \frac{1}{2}t^2$

$\theta_1(t) = \theta_2(t) \rightarrow 10t = \frac{1}{2}t^2 \rightarrow 20t = t^2 \rightarrow t^2 - 20t = 0$

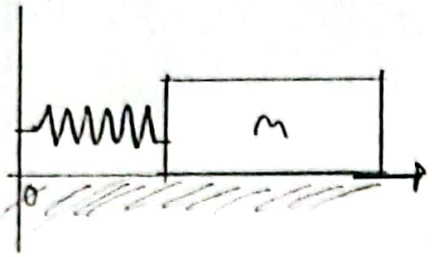
$t(t-20) = 0 \rightarrow t_1 = 0$ (Donde del mismo punto)

$t_2 = 20$ (Se encuentran)

$\theta_2(t) = \frac{1}{2}(2 rad/s^2)(20s^2)$

$\theta(t) = 200 rad \times \frac{1 vuelta}{6.28 rad} = 31.83$

Pregunta 3



$t=0$ → Máxima velocidad, va hacia la derecha

$V(t) = A\omega \operatorname{sen}(\omega t + g)$

$a(t) = A\omega^2 \cos(\omega t + g)$

$\frac{dV(t)}{dt} = 0 \rightarrow$ $t=0$ → Velocidad Máxima → $0 = -A\omega^2 \cos g$ → como $A\omega^2 \neq 0$

entonces $\cos g = 0 \rightarrow g = \frac{\pi}{2}$ y $g = -\pi/2$

$g = \frac{\pi}{2}$ rad $\approx 1,5708$ rad

1.5708

$G = 6{,}673 \times 10^{-11}\ N\,m^2/kg^2$;

Pregunta 4

$F = \frac{G \cdot M_T \cdot m_s}{d^2}$ a fuelle el planeta duele $M = 10 M_T$, $r = 2 r_T$

Fuerza hacia Satelite

$F_T = \frac{G M_T m_s}{(r_T + 0)^2}$

Fuerza Planeta Satelite

$F_p = \frac{G \cdot 10 M_T m_s}{(2r_T + d)^2}$

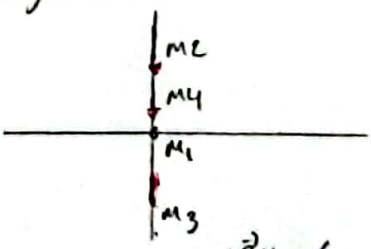
$\frac{F_p}{F_T} = \frac{G \cdot 10 M_T \cdot m_s}{(2r_T + 0)^2} \cdot \frac{(r_T + 0)^2}{G \cdot M_T \cdot m_s} \rightarrow \frac{F_p}{F_T} \frac{10 (r_T + 0)^2}{(2r_T + 0)^2} \rightarrow \frac{F_p}{F_T} = 10 \left(\frac{r_T + d}{2r_T + 0} \right)^2$

$\frac{F_p}{F_T} = 10 \cdot \left(\frac{r_T}{2r_T} \right)^2 = 10 \left(\frac{1}{2} \right)^2 = 10 \cdot \frac{1}{4} = \frac{10}{4} \rightarrow 2.5$

$F_p = 2.5 F_T$

Pregunta 5

	Masa kg	Coordenadas x(m)	Y(m)
M1	2	0.0	0.0
m2	4	0.0	2.0
m3	1	0.0	-1.0
m4	m_4?	0.0	1.0



$\vec{F}_1 = (0\hat{i} + 36\hat{j})\ N$

$\vec{F}_1 = \vec{F}_{2/1} + \vec{F}_{3/1} + \vec{F}_{4/1}$

$\vec{F}_{2/1} = \frac{G M_1 m_2}{d_{12}^2}(\hat{j}) = \frac{6(2)(3)}{12^2}(\hat{j})$

$\vec{F}_{4/1} = \frac{G M_1 m_4}{d_{14}^2} = \frac{G(2)m_4}{12}(-\hat{j}) = 2G m_4(-\hat{j})$

A) $-2G + 12G - 2m_4 G = 36 \rightarrow 2m_4 = 3 \rightarrow m_4 \rightarrow 1.5\ kg$

B) $M_3 = 6\ kg$; $\vec{F}_1 = (0\hat{i} + 10\hat{j})\ N$; $\vec{F}_3 = \frac{G(2)m_3}{d^2}$

$\vec{F}_1 = +12G + 12G - 3G + \frac{12G}{d^2} = 0 \rightarrow -36 = -\frac{12G}{d^2} \rightarrow 3 = \frac{12}{d^2} \rightarrow d^2 = \frac{12}{d^2} \rightarrow d^2 = \frac{12}{3} \rightarrow d = \pm 2$

$d = \pm 2$; Solo 2 positivos → $y = +2j$

A) 1.5 kg

B) y 2j

Onda Transversal

Pregunta 6

$V_{max} = 0,05 m/s$ $y(t) = A\cos(kx \pm \omega t + \varphi_0)$

$a_{max} = 50 m/s^2$;

A) Periodo

$v(t) = -A\omega \sin(kx \pm \omega t + \varphi_0)$ $v(t) = -A\omega \sin(kx \pm \omega T + \varphi_0)$

$\frac{dv(t)}{dt} = -A\omega^2 \cos(kx \pm \omega t + \varphi_0) = 0$; $\cos(kx \pm \omega t + \varphi_0) = 0$ $kx + \omega t + \varphi_0 = \frac{\pi}{2}$; $k = \frac{2\pi}{\lambda}$; $\omega = \frac{2\pi}{T}$

$\frac{da(t)}{dt} = A\omega^3 \cos(kx \pm \omega t + \varphi_0) = 0 \rightarrow \cos(kx \pm \omega t + \varphi_0) = 0 \rightarrow kx \pm \omega t + \varphi_0 = \frac{\pi}{2}$

$V_{max} = A\omega$, $A_{max} = A\omega^2$ $\Rightarrow \frac{A_{max}}{V_{max}} = \frac{50 m/s^2}{0,05 m/s} = \frac{A\omega}{A\omega^2} = \frac{1}{\omega} = 1000 \rightarrow \omega = 0,001 rad/s$

$\omega = \frac{2\pi}{T} \Rightarrow T = \frac{2\pi}{\omega} \rightarrow T = \frac{2\pi rad}{0,001 rad/s} \rightarrow 6283.19 s$

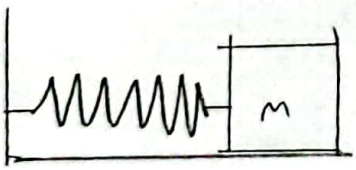
b) $V_{prop} = 2 m/s \rightarrow T = \frac{\lambda}{V} \rightarrow \lambda = (6283,19 s)(2 m/s) \rightarrow \lambda = 12566,38 m$

$k = \frac{2\pi}{\lambda} = k = \frac{2\pi}{12566,38} \rightarrow 0.0005 \rightarrow k = 5 \times 10^{-4} m^{-1} = 0,0005 m^{-1}$

A) 6283.19 s

B) $0,0005 m^{-1}$

Pregunta 7



$m = 0,40 kg$

$t = 0s \rightarrow x = -15 m$

$V_0 \rightarrow$ cambia con x y t

$T = 0,80 s$ / ciclo

a) $K(N/m)$ $t = 0 \rightarrow x(t) = -0,15 m$

$x(t) = A\cos(2\pi f t)$; $-15 = A \cdot \cos(\ldots)^1$

$A = -0,15 \rightarrow 0,15 m \rightarrow T = 2\pi\sqrt{\frac{m}{K}} \Rightarrow \frac{T}{2\pi} = \sqrt{\frac{m}{K}}$

$\frac{0,80 s}{2\pi} = \sqrt{\frac{0,40}{K}} \rightarrow 0,01621$

$= \frac{0,40}{K} \rightarrow K = 24,67 N/m$

b) $x(t) = 0,15\cos(2\pi f t)$; $T = \frac{1}{f} \Rightarrow f = \frac{1}{0,80} = 1,25$

$x(t) = 0,15\cos(2,5\pi t) \Rightarrow t = 4s \rightarrow x(t) 0,15\cos(2,5)(4)(\pi)$

$x(t) = 0,15\cos(10\pi)$ $x(t) = 0,15 m$

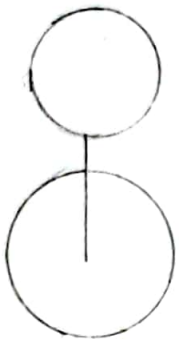
A) 24.67 N/m

B) 0.15 m

Pregunta 8

$G = 6.673 \times 10^{-11}\ N \cdot m^2/kg^2$

Masa de la tierra



$m = 1,500,0\ kg$

$T = T,616,53)$

$mT = 5,93 \times 10^{24} kg$

$RT = 6370\ km = 6,37$