

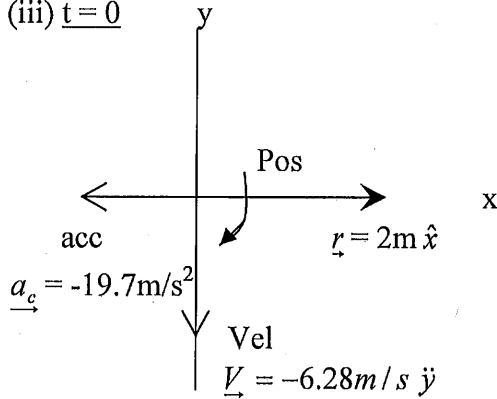
Answers – Week 5

5-1. 30 rpm = 1 rev every 2 secs.

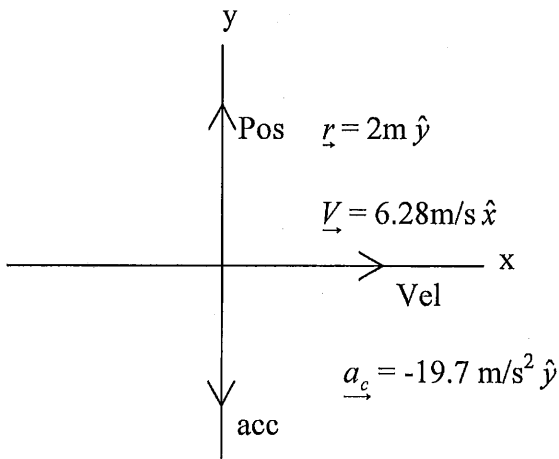
(i) $T = 2 \text{ sec}$

(ii) $\underline{\omega} = -\frac{2\pi}{T} \hat{z} = -3.14 \text{ rad/s } \hat{z}$

(iii) $t = 0$



$t = 1.5 \text{ sec}$



5-3. The spring must stretch because it has to provide $\underline{F}_c = -M R \omega^2 \hat{r}$ and when it

stretches $\underline{F}_{SP} = -k \Delta r \hat{r}$

$$\Delta r = \frac{MR\omega^2}{k} = 1.23 \times 10^{-3} \text{ m}$$

5-5. $\tan \theta = \frac{R\omega^2}{g} = 0.11$

$\theta = 6.4^\circ$

5-7. You will lose contact if the apparent weight (normal force) goes to ZERO.

$$N_R - Mg = \frac{-MV^2}{R}$$

$$V = \sqrt{Rg} = \sqrt{20 \times 9.8} = 14 \text{ m/s.}$$

5-9. The physics is much the same as problem 5-5

$$\tan \theta = \frac{V^2}{Rg}$$

$$\theta = 13.8^\circ$$

$$V = 60 \text{ mph} = 26.83 \text{ m/s}$$

5-11. To make particle separate out the F_c required to keep in circle must become larger than the available force 10^{-4} N .

$$\omega = 14.1 \text{ rad/s}$$