

10-1) Stepper motor $\beta = 1.5^\circ/\text{step}$ $f_p = 500 \text{ Hz}$

find $N_s = \text{RPM}$

$$N_s = \frac{\beta \cdot f_p}{6} \text{ RPM} = \frac{1.5 \cdot 500}{6} = \boxed{125 \text{ RPM}}$$

10-2) Stepper motor Rated @ 500 steps/Rev = resolution

find # of steps req'd to move shaft $75.6^\circ = \Theta$

$$\text{Resolution} = \frac{360^\circ}{\beta}$$

$$\beta = \frac{360^\circ}{500} = .72^\circ/\text{step}$$

$$\Theta = \beta \cdot \text{Steps} \quad \text{Steps} = \frac{\Theta}{\beta} = \frac{75.6^\circ}{.72^\circ/\text{step}} = \boxed{105 \text{ steps}}$$

10-3) Stepper motor $\beta = 3.75^\circ$, find resolution

$$\text{Resolution} = \frac{360^\circ}{\beta} = \frac{360^\circ}{3.75^\circ} = \boxed{96}$$

10-4) Stepper motor $\beta = .15^\circ$, find resolution

$$\text{Resolution} = \frac{360^\circ}{\beta} = \frac{360^\circ}{.15^\circ} = \boxed{2400}$$

10-5) step motor $\beta = 15^\circ$

A) find resolution, $= \frac{360^\circ}{\beta} = \frac{360^\circ}{15^\circ} = \boxed{24}$

B) find Θ after 25 steps

$$\Theta = \beta \cdot \text{step} = 15^\circ/\text{step} \cdot 25 \text{ steps} = \boxed{375^\circ}$$

10-6) step motor $\beta = 7.5^\circ$ Signal pulses every
find shaft RPM = n_s 250 ms

$$f_p = \frac{1 \text{ sec}}{P_{\text{interval}}} = \frac{1}{.250} = 4 \text{ Hz}$$

$$n_s = \frac{\beta \cdot f_p}{6} = \frac{7.5^\circ \cdot 4 \text{ Hz}}{6} = \boxed{5 \text{ RPM}}$$

10-7) Brushless DC motor - Fig 10-21(a)
driven by signals in Fig 10-23 signal period = 150ms
find motor RPM = n_s $P = 2$

$$n_s = \frac{120 \cdot F}{P} = \frac{120 \cdot 6.667}{2} = \boxed{400 \text{ RPM}}$$

$$F = \frac{1 \text{ sec}}{.150 \text{ sec}} = 6.667 \text{ Hz}$$