WS-13 for 7th class

Ttask

① $Mg = 400\,N$.

$h = 5\,m$ in $t = 6\,sec$.

$$\omega = \frac{P}{t} = \frac{mgh}{t}$$

$$\omega = \frac{400 \times 5}{6}$$

$$= \frac{1000}{3} = 333.33\,\omega$$

② $P = 20\omega$; $m = 80\,kg$

$$P = \frac{E}{t} \Rightarrow E = P \times t$$

$$\Rightarrow E = 20 \times 365 \times 24$$

$$= 175200\,wh$$

$$E = 175.2 \times 10^3\,wh$$

$$E = 175.2\,kwh$$

$[t = 1\,year]$

③ $\eta = 80\%$.

$$\frac{P_{out}}{P_{in}} = \frac{80}{100}$$

$$\Rightarrow P_{out} = \frac{80}{100} \times P_{in}$$

$$\Rightarrow P_{in} = \frac{100}{80} P_{out}$$

$$= \frac{5}{4} \times 800 \times 40$$

$$P_{in} = 4\,kw$$

$vol = 800\,lit$

$= 800 \times 10^{-3}\,m^3$

$d_\omega = 10^3\,kg/m^3$

$m_\omega = d_\omega \times vol$

$= 10^3 \times 800 \times 10^{-3}$

$m_\omega = 800\,kg$

$t = 9.8\,sec$

$h = 40\,m$

$$P_{out} = \frac{mgh}{t}$$

$$P_{out} = \frac{800 \times 9.8 \times 40}{9.8}$$

$$P_{out} = 800 \times 40$$

$$= 32\,kw$$

④ $m = 2000\,kg$

$N = 18\,kmph = 5\,m/sec$

$P = mg\sin\theta\, v \quad [\sin\theta = \frac{1}{50}]$

$= 2000 \times 10 \times \frac{1}{50} \times 5$

$= 2000\,\omega$

$= 2\,kw$

⑤ $m = 2 \times 10^4\,kg$

$t = hrs$; $h = 90\,m$

$$\eta = \frac{P_{out}}{P_{in}} = \frac{5000}{P_{in}}$$

$$\Rightarrow \frac{80}{100} = \frac{5000}{P_{in}}$$

$$\Rightarrow P_{in} = 5 \times 5000$$

$$\Rightarrow P_{in} = 6.25 \times 10^3\,\omega$$

$$\Rightarrow P_{in} = 6.25\,kw$$

$$P_{out} = \frac{mgh}{t} = \frac{2 \times 10^4 \times 10 \times 90}{3600}$$

$$= \frac{1}{2} \times 10^4$$

$$P_{out} = 5000\,\omega$$

⑥ $n = 480$

$m = 20 \times 10^{-3}$ kg

$t = 60$ sec

$P = 7.2$ kw $= 7.2 \times 10^3$ w

$P = \frac{w}{t} = \frac{n \frac{1}{2} mv^2}{t}$

$\Rightarrow 7.2 \times 10^3 = \frac{480 \times \frac{1}{2} \times 20 \times 10^{-3} \times v^2}{60}$

By simplifying this.

$\Rightarrow v = 300$ m/sec

⑦ $m_2 = 2m$

$v_2 = \frac{1}{2} v_1$

Power $= \frac{w}{t} = \frac{\frac{1}{2} mv^2}{t}$

$P \propto mv^2$

$\Rightarrow \frac{P_1}{P_2} = \left(\frac{m_1}{m_2}\right)\left(\frac{v}{v_2}\right)^2$

$= \frac{m}{2m}\left(\frac{v_1}{\frac{v_1}{2}}\right)^2$

$= \frac{1}{2} x^2 = 2$

⑧ Vol $= 20 m^3$ $t = 40$ min $h = 40$ m

$\eta = 60\% \Rightarrow \frac{P_{out}}{P_{in}} = \frac{60}{100}$

$\Rightarrow \frac{10 \times 10^3}{P_{in}} = \frac{3}{5}$

$\Rightarrow P_{in} = \frac{5}{3} \times 10^3 = 5.5 \times 10^3$ w

$P_{out} = \frac{w}{t} = \frac{mgh}{t} = \frac{d \times Vol \times g \times h}{t}$

$P_{out} = \frac{10^3 \times 20 \times 10 \times 40}{40 \times 60 \times 3}$

$= \frac{10^3}{3}$ w.

⑨ $P = \frac{1}{2} P_{avg}$ $\{F = ma$

$= \frac{1}{2} Fv$ $= d \times V \times a$.

$= \frac{1}{2} dA \cdot v^2 v$ $= d \times A \times l \times \frac{v}{t}$

$= \frac{1}{2} dAv^3$ $\Rightarrow dAv^2$.

LTask

① $m_L = 80$kg ; $h = 20$m

$t = 25$ sec $P = 1568$w

$P = \frac{w}{t} = \frac{Mgh}{t}$

$\Rightarrow 1568 = \frac{(M_m + M_L)\, 10 \times 20}{25}$

$\Rightarrow 196 = (M_m + 80)$

$\Rightarrow M_m = 196 - 80$

$\Rightarrow M_m = 116$ kg

② $T = 9000$ N.

$v = 4$ m/sec

$P = F \cdot v$

$\Rightarrow P = T \cdot v$

$\Rightarrow P = 9000 \times 4$

$\Rightarrow P = 36$ kw

③ $n = 3$; $v = 15$ m/sec

$t = 1$ sec ; $m = 0.4$ kg

$P = \frac{w}{t} = \frac{n \frac{1}{2} mv^2}{t}$

$= \frac{3 \times \frac{1}{2} \times 0.4 \times (15)^2}{1}$

$P = 3 \times 45$

$P = 135$ w

④ Vol $= 2400$ lit

$= 2400 \times 10^{-3} m^3$

$P = \frac{w}{t} = \frac{mgh}{t}$

$P = \frac{d \times Vol \times g \times h}{t}$

$P = \frac{10^3 \times 2400 \times 10^{-3} \times 10 \times 24}{12 \times 60}$

$P = 800$ w

$= 0.8$ kw

⑤ Vol $= 400$ lit.

$m_w = d_w \times Vol$

$m_w = 10^3 \times 400 \times 10^{-3} = 400$ kg

$P = \frac{w}{t} = \frac{mgh}{t}$

$P = \frac{400 \times 9.8 \times 40}{98}$

$P = 1600$ w

$\Rightarrow 1.6$ kw

⑥ $\frac{m}{t} = 8 \times 10^3$ kg/sec.

$v = 140$ m/sec.

$P = \frac{w}{t} = \frac{\frac{1}{2} mv^2}{t}$

$= \frac{1}{2} \times 8 \times 10^{-3} \times (140)^2$

$= 4 \times 10^{-3} \times 140 \times 140$

$= 78.4$ w

⑦ $T = 2000$ N

$v = 6$ m/s

$P = T \cdot v$

$= 2000 \times 6$

$= 12$ kw

⑧ $m = 10 \times 10^3$ kg

$t = 4$ sec.

$P = 4$ kw $= 4 \times 10^3$ w

$P = \frac{w}{t} = \frac{\frac{1}{2} mv^2}{t}$

$4 \times 10^3 = \frac{\frac{1}{2} \times 10^4 \times v^2}{4}$

$\Rightarrow v^2 = \sqrt{32} = 5.656$ m/sec.

⑩ $\eta_E = 80\%$ $\eta_{pump} = 70\%$

$\eta_T = \eta_E \times \eta_P$

$= 80\% \times 70\%$

$= 56\%$