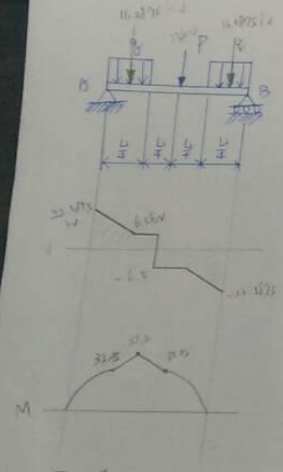
例題 3.6-2

一簡支樑 AB 受載重作用，如圖所示。若 $\sigma_{allow} = 124\ MPa$，$L = 9.75\ m$，$P = 13\ kN$ 及 $q = 6.6\ kN/m$，計算所需的截面模數 S。然後，由附錄 B 的表 B-2 中，挑選一合適的標準梁，接著，將梁的自重列入計算，重新求 S。必要時，挑一新的梁尺寸。



$\sigma = 124$

$9.75 \div 4 = 2.4375\ m$

$6.6 \times 2.4375 = 16.0875$

$A + B = 45.175\ kN$

$9.75A = 16.0875 \times \frac{L}{8} + 13 \times \frac{L}{2} + 16.0875 \times \frac{7L}{8}$

$9.75A = 16.0875 \times 1.21875 + 13 \times 4.875 + 16.0875 \times 8.53125$

$9.75A = 220.225125\ kN$

$A = 22.5875\ kN\ (\uparrow)$，$B = 22.5875\ kN\ (\uparrow)$

$22.5875 - 16.0875 = 6.5\ kN$

$\frac{(22.5875 + 6.5) \times \frac{9.75}{4}}{2} = 31.45039663$

$6.5 \times \frac{9.75}{4} = 15.84375$

$25.93789063 + 15.84375 = 51.78164063$

$S = \frac{M}{\sigma} \geq \frac{51.78164063}{124} \rightarrow S = 0.413624244\ m^3 = 413.6624244\ cm^3$ (用 IPN >60)

$w = 41.9\ kg/m = 410.9\ N/m$，$g = 9.8067\ m/s^2$

IPN >60 $\sum M_A = 0$

$13 \times \frac{L}{5} + 6.6 \times \frac{L}{4} \times \frac{L}{8} + 6.6 \times \frac{L}{4} \times (\frac{3L}{4} + \frac{L}{8}) + W \times L \times \frac{L}{2} = R_B \times L$

$R_B = 24.6\ kN$

$\sum F_y = 0$

$R_A = 13 + 2 \times 6.6 \times \frac{L}{4} + W \times L - R_B$ $\quad R_A = R_B = 24.6\ kN$

$R_A = 24.6\ kN$

$M = 56.54\ kN \cdot m$

IPN >80 $\sum M_A = 0$ $\quad w = 469.7\ N/m$

$R_B = 25\ kN$ $\quad R_A = 25\ kN$

$M = 58.5\ kN \cdot m$

$S = \frac{56.54}{124} = 455.96\ cm^3$ (用 IPN >80)

IPN >80 $= \frac{56.54 \times 1000000\ N \cdot mm}{124} = 455967.7419$

$S = \frac{58.5}{124} = 471.7741935\ cm^3$