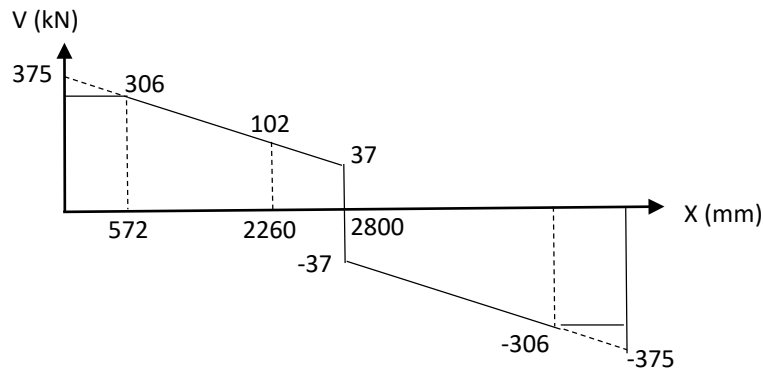


CVG3148 - ASSIGNMENT 6 – Solutions (Summary)

Problem 1 (30marks)

a)

$$V_f = 375 \text{ kN}, V_f @ \text{mid span} = 37 \text{ kN}, V_f @ x = 2.26 \text{ m} = 102 \text{ kN}, V_f @ d_v = 306 \text{ kN}$$



b)

$$V_R = V_C = 206 \text{ kN} > V_f = 102 \quad \text{OK}$$

c)

$$V_R = V_{Cb} + V_S = 254 + 309 = 563 \text{ kN} \quad V_R > V_{f,max} = 306 \text{ kN} \quad \text{OK}$$

$$A_{v,min} = 102 \text{ mm}^2 < A_v = 200 \text{ mm}^2 \quad \text{OK}$$

$$\text{Or, } S_{max,2} = 351.4 \text{ mm} > 180 \text{ mm} \quad \text{OK}$$

$$V^* = 1115 \text{ kN}$$

$$S_{max,1} = \min \left\{ \begin{array}{l} 600 \text{ mm} \\ 0.7d_v = 0.7 * 572 = 400.4 \text{ mm} \leftarrow \text{controls} \end{array} \right.$$

$$S_{chosen} \leq S_{max} \rightarrow 180 < 400.4 \text{ mm} \quad \text{OK}$$

$$V_R = 563 \text{ kN}, V_{R,max} = 2231 \text{ kN}$$

$$V_R \leq V_{R,max} \quad \text{OK}$$

Problem 2 (30marks)

$$W_f * \frac{L}{2} = 100 * \frac{9}{2} = 450 \text{ kN}, \quad V_f @ d_v = 403 \text{ kN} = V_{f,max}$$

$$V_{Ca} = 91 \text{ kN}, \quad V_{Cb} = 105 \text{ kN}$$

$$V_S = V_{f,max} - V_{Cb} = 298 \text{ kN}$$

$$S_{load} = 154 \text{ mm},$$

$$\text{Chosse } S_{chosen} = 150 \text{ mm} \leq S_{load} = 154 \text{ mm}$$

$$V^* = 461 \text{ kN}$$

$$S_{max.1} = \min \begin{cases} 600 \text{ mm} \\ 0.7d_v = 0.7 * 472.5 = 331 \text{ mm} \leftarrow \text{controls} \end{cases}$$

$$S_{max} = \min \begin{cases} S_{max.1} = 331 \text{ mm} \leftarrow \text{controls} \\ S_{max.2} = 703 \text{ mm} \end{cases}$$

$$S_{chosen} = S_2 = 150 \text{ mm} \leq S_{max} = 331 \text{ mm} \quad \text{OK}$$

$$V_S = 306 \text{ kN}$$

$$V_{s.min} = 139 \text{ kN}$$

Define regions for shear reinforcement;

	Shear force range	S	V_R	$V_R \geq V_f$
Region 0	$V_f \leq V_{Ca}$	No required	$V_R = V_{Ca} = 91 \text{ kN}$	OK
Region 1	$V_c < V_f < V_{R.min}$	$S_{load} = 330 \text{ mm}$	$V_R = V_{Cb} + V_{s.min}$ $= 244 \text{ kN}$	OK
Region 2	$V_{R.min} < V_f < V_{f.max}$	$S_s = 150 \text{ mm}$	$V_R = V_{Cb} + V_S$ $= 411 \text{ kN}$	OK

