

**Question 1:** Calculate the section modulus of an angle section of  $110 \times 50 \times 8$  attached to a plate with a thickness of 10 mm. (30 points)

Note that:  $SM = I_{NA} / y_{\max}$ ;  $I_{NA} = \sum I_i + \sum A_i \times d_i^2$ ;  $y_{NA} = \sum A_i \times y_i / \sum A_i$

**Question 2:** A view of part of a dry cargo ship whose main particulars are given below, is shown in Figure. Find the scantlings of the spotted structural members ?1, ?2, ?3 and ?4. For ?4 a tubular section with an outer diameter of 200 mm and a thickness of 10 mm. Calculate the concentrated load in [kN] (70 points)

$$L = 90 + 5 \times n \text{ [metre]}; \quad L/B = 7.0; \quad B/T = 2.5; \quad L/D = 11.0; \quad c_B = 0.7; \quad V_0 = 17 \text{ knots.}$$

Frame spacing is 700 mm, while the distance between solid (plate) floors is 2.8 metres. The steel used is the normal strength steel whose yield stress ( $R_{eH}$ ) is 235 [N/mm<sup>2</sup>] and the modulus of elasticity (E) is 200 GPa. Maximum normal stress at bottom ( $\sigma_{LB}$ ) due to bending is 120 [N/mm<sup>2</sup>]. Please state any other assumptions that you may need.

