MEEN 10060 – Design Lab
Analysis of Simply Supported Beams – Assignment

Instructions:

- For each of the problems given, please enter the relevant values into the blank spaces provided on the Answer Sheet.
- Return the completed answer sheet to the School Office.
- For some of the variables used in the calculation, the value is based on numbers selected from your 8 digit student ID number (including leading zero's if relevant).
- To determine which element of your Student ID number to use, each digit is referenced as 'a' to 'h' as shown in the text box below.
- Assignment deadline – submission by 12 noon Friday 5th April.

Student Name:

Student Number:

a	b	c	d	e	f	g	h

Example – use of Student ID in calculating input variables
Student Number:

0	1	2	3	4	5	6	7
a	b	c	d	e	f	g	h

Value = (a+b+c) = (0+1+2) = 3

Value = (e*f) = (4*5) = 20

Value = (c/d) = (2/3) = 0.667

L = 1 + (b/10) + (c/100) m = 1.12 m

W = (b+c) * 1000 N = 3,000 N

Questions have been defined in order to minimise the chance of:

(a) defining values that result in dividing by zero.
(b) defining values that are zero.

If either of these scenarios should happen, please use '1' instead of '0' for the relevant Student ID digit. For example:

Value = (b/a) = (1/0) = ∞ ! - use a = 1: Value = (1/1) = 1 instead
Value = (a/10) = (0/10) = 0 – use a=1: Value = (1/10) = 0.1 instead.

Problem 1: Concentrated Loads

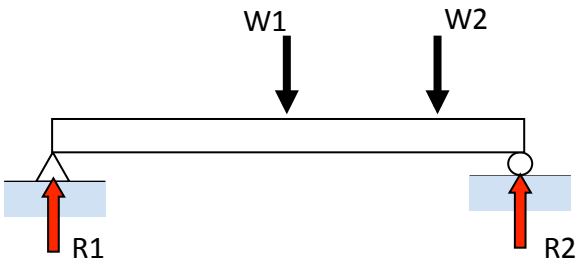

Figure 1: Simply supported beam subjected to 2 point loads

For the simply supported beam shown above, the distance between the supports is 6m. The magnitude of load W1 is (a+b) kN and it is applied at mid-span. The magnitude of load W2 is (c) kN and it is applied one metre from support 2. Calculate R1, R2 and the magnitude of the maximum bending moment M.

Problem 2: Second Moment of Area (I) calculation

Three identical plates (d x 4d) are bonded together to make beams of cross-sections shown in Figure 2 (a) and 2 (b) above.

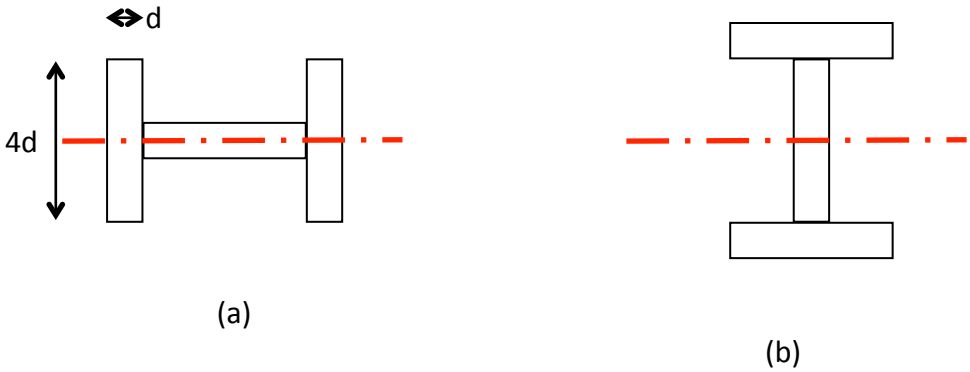

Figure 2: I-beams of different orientation constructed from component parts using beams of dimension (d x 4d)

Using your student ID number as defined above to give you the value for d (cm), what is the second moment of area (I) for each cross-section about the neutral axis (illustrated in red)?

Problem 3: Second Moment of Area (I) Calculation

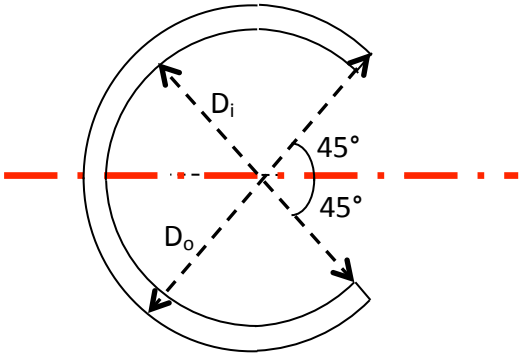

Figure 3: Tubular cross-section

For the circular tube of cross-section shown in Figure 3, calculate the second moment of area (I) about the axis illustrated in red, where:

D_o = ((g + h)/10) m and
D_i = 0.8*D_o m

Problem 4: Bending Stress Calculation

Using the value for the maximum bending moment calculated for the simply supported beam under four-point bending load in Problem 1, calculate the maximum bending stress if the beam has a rectangular cross-section (W x H). The dimensions are calculated by:

Width = (e + f)/10 cm
Height = 3 x (e + f) /10 cm

MEEN10060 – Design & Materials
Individual Assignment
Answer Sheet

Student Name:

Student Number:

a	b	c	d	e	f	g	h

Question 1: Answers:

	R1 (kN)	R2 (kN)	M (kNm)
Q1			

Question 2: Answers:

	I (cm^4)
Q2 (a)	
Q2 (b)	

Question 3: Answer:

	I (m^4)
Q3	

Question 4: Answer

	σ (N/mm^2)
Q4	