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Family Name					
Given Name/s					
Student Number					
Teaching Period	Semester 1, 2018				

ENG467 – Design of Steel Structures	DURATION	
	Reading Time:	10 minutes
	Writing Time:	120 minutes
INSTRUCTIONS TO CANDIDATES		
<p>Answer all questions. Make appropriate assumptions where necessary and state your assumptions. Marks for each question indicated below each question. Total marks for this examination is 100.</p>		
EXAM CONDITIONS		
<p><u>You may begin writing from the commencement of the examination session.</u> The reading time indicated above is provided as a guide only.</p>		
This is a RESTRICTED OPEN BOOK examination		
Any non-programmable calculator is permitted		
No handwritten notes are permitted		
No dictionaries are permitted		
ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED	
Lecture Textbook/s (Annotated Permitted)	1 x 16 Page Book 1 x Scrap Paper	

**THIS EXAMINATION IS PRINTED
DOUBLE-SIDED.**

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LEFT BLANK.**

Answer all questions.

Q1

- a. What are the different kinds of stiffeners we can use to strengthen the web of a steel beam? What situation determines which kind to use?
- b. Load bearing stiffeners are also used to provide torsional restraint at the support. Detail the steps involved in designing for such restraint.

(10marks)

Q2.

A simply supported beam of 7.5 m length is to carry a point dead load of 50 kN at its midpoint and a uniformly distributed dead load of 5 kN per metre. The beam is 310 UB 40.4 kg. Check whether the beam satisfies the serviceability condition for deflection. Take Elastic modulus as 200×10^3 MPa

(8marks)

Q3.

Discuss the factors you will consider in design in prolonging fatigue life and protection against corrosion.

(8marks)

Q4

A pin ended beam-column, 250 UC 72.9, of grade 300 steel is 6 m long. An axial gravity load of 400 kN is applied concurrently with a lateral wind load of 60 kN at mid span. Loads are ultimate loads. The member is bent about its strong axis and laterally restrained to prevent buckling. Determine whether the design is safe

(16marks)

Q5

A structural beam-column is loaded with biaxial bending. Details as follows:

$$M_{sx}=50\text{kNm} \quad M_{sy}=30\text{kNm} \quad M_x^*=20\text{kNm} \quad M_{bx}=28\text{kNm}$$

$$N_s=N_t=450\text{kN} \quad M_y^*=13\text{kNm} \quad N^*=100$$

Determine whether member is safe

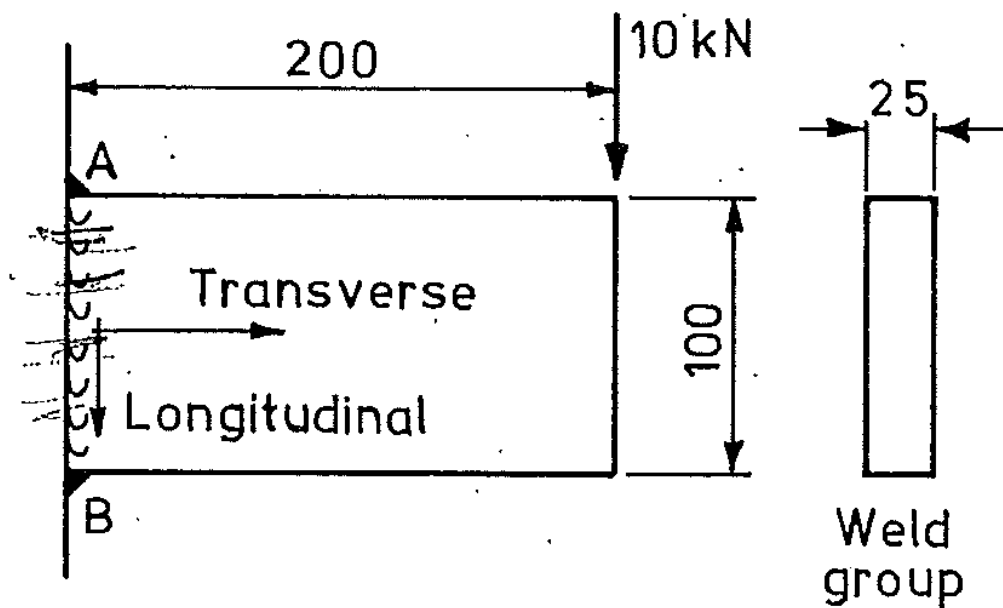
(10marks)

Q6

The bar shown below has dead load of 10 kN applied. Calculate the size of fillet weld required. Use E48XX electrodes and allow for SP welding.

Given $Z_w = bd + d^2$

All Dimensions in mm.



(Applied Mechanical design A.K Hosking)

(10 marks)

Q7

M20 bolts in a group are tightened to category 8.8/TB. Threads are excluded from the shear plane. Each bolt has a tensile load of 63 kN applied concurrently with shear load of 25kN. Check the value of the interaction equation.

(12marks)

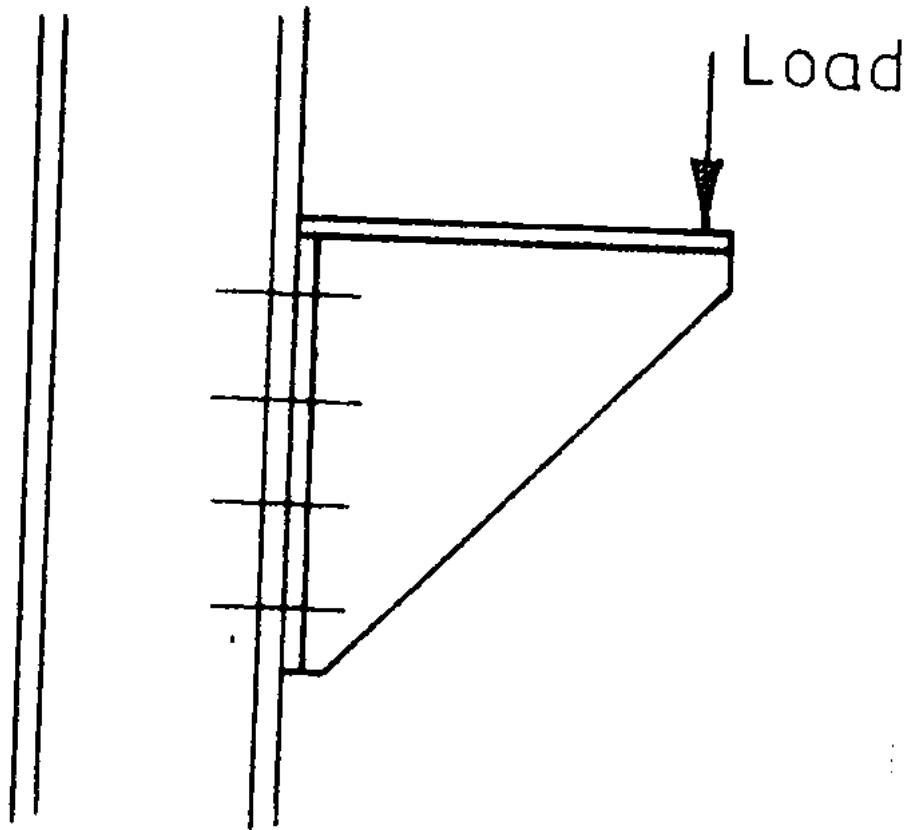
Q8

Discuss the steps and checks involved in a Beam-Column design.

(10marks)

Q9

Check whether the bolted connection shown satisfies the structural conditions necessary. Bolt threads are in the shear plane. Bolting category is 4.6/S. The total ultimate load applied is 100kN. The point load is applied at a distance 300 mm from the column. There are 2 rows of 4 number 24 mm diameter bolts. Vertical spacing between the bolts is 75 mm.



(16marks)