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

ENG215 – Surveying and Construction	DURATION	
	Reading Time:	10 minutes
	Writing Time:	120 minutes
INSTRUCTIONS TO CANDIDATES		
<ol style="list-style-type: none"> 1. Read all questions carefully. 2. Answer all questions. This exam has TWO parts. 3. Questions are not of equal value. Question value indicates length of required response. 4. Show all working and diagrams as necessary. 5. This exam constitutes 50% of the total marks for this unit. 6. Use dark blue or black ink. 		
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 CLOSED 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	
No additional printed material is permitted	1 x 20 Page Book	

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

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PART A: Short Answer Questions (35 Marks)

(answer all 16 questions, you may use dot points if preferred, use diagrams as necessary)

Explain the following terms:

- A1.** Effective length (1 Marks)
- A2.** Strut end conditions, use sketches (3 Marks)
- A3.** Euler's buckling formula, what are the limitations? (4 Marks)
- A4.** For long struts, what are the two main factors which determine the maximum carrying capacity? (2 Marks)
- A5.** Eccentric loading (1 Marks)
- A6.** Proof stress. (1 Mark)
- A7.** How do you calculate the elastic modulus from the stress-strain graph? (2 Marks)
- A8.** Manufactured timber products, and why are they often preferred over timber products "straight from the tree"? (3 Marks)
- A9.** Water:cement ratio (2 Marks)
- A10.** Discuss the use of beach sand in a concrete mix (2 Marks)
- A11.** Trial concrete mixes, and why are they necessary? (2 Marks)
- A12.** Concrete workability testing, use a sketch. (3 Marks)
- A13.** Compressive Strength of concrete (1 Mark)
- A14.** Pre-stressed and Post-stressed Concrete (2 marks)
- A15.** Non-destructive testing methods for steel (3 Marks)
- A16.** Corrosion protection methods for steel (3 Marks)

PART B: Extended Questions (74 Marks)

(answer all 5 questions)

Question B1. (5 Marks)

Discuss why it's important to consider drainage before commencing construction on any building site. Include methods of controlling surface water before it enters underground drains and also a discussion of the methods of keeping silt and other debris out of underground drains. (5 Marks)

Question B2. (20 marks)

- a) Draw a labelled typical stress-strain diagram for a ductile material and explain how it would differ for a brittle material. (5 marks)
- b) Why is it preferable to use elastic/plastic materials rather than elastic/brittle materials in construction? (2 marks)
- c) Why is it important to have a clear knowledge of a material's mechanical properties before using it for construction? (2 marks)
- d) List the material and other properties you think are important in a building material. (5 Marks)
- e) With reference to steel, concrete and timber; describe the difference between the behaviour of each in compression and tension, and the mode of failure. Include examples of how the behaviour of these materials restricts their use. (6 Marks)

Question B3. (12 Marks)

- a) What is the preferred cross section for a strut? Explain (6 Marks)
Is the above cross-section used often, why/ why not?
Give two examples of typical strut cross-sections
- b) What is the preferred cross section for a beam? Explain (6 Marks)
Is the above cross-section used often, why/ why not?
Give two examples of typical beam cross-sections

Question B4. (22 Marks)

- a) What are the features of satisfactory aggregate for use in concrete? (4 Marks)
- b) What precautions need to be taken when using reinforcing steel in concrete? (4 Marks)
- c) What effect to the following have on the design of a concrete mix? (8 Marks)
 - I. High rise construction (2 Marks)
 - II. Closely spaced reinforcement (2 Marks)
 - III. Hot weather (2 Marks)
 - IV. Cold weather (2 Marks)
- d) Apart from very large-scale construction, what are the advantages of having concrete mixed at a batching plant and delivered to site in trucks compared with mixing concrete on site? (3 Marks)
- e) Concrete for driveways often has to be driven over well before the usual 28 day curing period has passed. What methods are used to allow the concrete to withstand these high early loads? (3 Marks)

Question B5. (15 marks)

- a) Imagine you are designing a new road that will connect Palmerston to a proposed residential development 10 km away. What are some of the important design considerations? (5 Marks)
- b) Explain the two methods of using bitumen as a road surface. Include: (10 Marks)
 - I. A description of each method
 - II. Examples of situations where each method is used
 - III. Reasons why each method is preferred in the above situations
 - IV. Any limitations or reasons that the methods might not be used.