

UNIVERSITY OF SASKATCHEWAN
COLLEGE OF ENGINEERING

MECHANICAL ENGINEERING (M.E.) 214

ALL SECTIONS
MID-TERM EXAM

OPEN BOOK

CALCULATORS ARE ALLOWED

TIME: 1.5 HOURS

OCTOBER 2003

Candidates are to answer all questions.
You are to show your solution in the space below the question.
The reverse side of the page may be used if required.
State all necessary assumptions.

NEATNESS and CLARITY will be considered in the marking of this
examination

NAME:	_____	Marks
	(First Name) (Last Name)	
		1. _____
Name of Lecturing Professor:	_____	2. _____
		3. _____
Student Number:	_____	4. _____
		TOTAL. _____

Examination Room: _____

There are 10 marks for each question.

- Note:**
- make sure you have 4 problems in the exam
 - the questions are of equal value

Question 1 (a) On an oblique representation of a cubic unit cell, sketch (011) and (201). What are the indices of the line of intersection?

Question 2 Short-term high-temperature creep tests were performed and the results were to be used to predict long-term low-temperature performance. The steady state creep rate at 800 °C was found to be 1.2 % per hour and the steady state creep rate at 700 °C was found to be 0.04 % per hour. The stress applied was constant and was the same for each test.

- (a) Estimate the steady state creep rate to be expected at 500 °C.
- (b) State all the assumptions made that allowed you to perform that estimation.

Question 3 During carburising, carbon is diffused into austenite (f.c.c. Fe) from an environment of constant carbon concentration. If the required depth of carburisation is achieved at 900 °C in 10 hours, what time would be required at 950 °C?

Question 4 The non-destructive testing department assures you that they can detect any cracks greater than 3.5mm in a 2024 -T3 component. The dimensions of the component are 900 mm long 200 mm wide and 5 mm thick. In service a tensile load is applied parallel to the long axis.

Determine what you believe to be the maximum load that should be applied to the component, giving reasons for your decision.