

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.