1. Explain the differences in the electrochemical mechanism of protection offered by (i) zinc (Std. potential -0.76 V) and (ii) tin (-0.14 V), applied as coating on steel (Fe).

2. Define sensitization? Explain the available methods for avoiding sensitization in welded austenitic stainless steels?

3. What is crevice corrosion – explain how it occurs?

4. Describe (briefly) ways of mitigating corrosion problems in-service.

5. Pr. 6.12 of text (p. 101)

6. Pr. 6.27 of text (p. 102)

7. Pr. 6.36 of text (p. 103)

8. (Pr. 6.42 of text) For a tensile test, it can be shown that \( \frac{d\sigma}{d\varepsilon} = \sigma_{\text{uts}} \) at UTS (at \( P_{\text{max}} \) or at necking where \( dP = \sigma dA + A d\sigma = 0 \); also known as tensile instability). Assuming that the standard work-hardening law (\( \sigma = K \varepsilon^n \)) is obeyed, show that the value of the true strain \( [\varepsilon_\text{u}] \) at the onset of necking is given by the work-hardening parameter \([n] \).

-------------------

Optional – do not hand-in

i. Identify what type/types of corrosion cell may be present in the following cases and identify the anode, cathode and electrolyte in each case with rough sketches:

a) A copper valve in a steel tube exposed to a marine atmosphere

b) A steel bolt joining two steel plates placed in open air

c) Revealing the microstructure of a single phase alloy through chemical etching

d) A galvanized steel pipe underground