MAS2202 Number Systems and the Foundations of Analysis

Semester 1: Mock Exam

This is the same as the MAS1202 exam except that there is an additional ninth question and also the marks for the first eight questions are different. The marks are: Q1 22; Q2 4; Q3 4; Q4 12; Q5 8; Q6 4; Q7 18; Q8 12; Q9 16. The extra question is the following.

9. (a) Let a and b be coprime integers and assume that $a|c$ and $b|c$, for some integer c. Show that $ab|c$.

(b) Let m and n be non-zero integers and let $d = \gcd(m, n)$. Assume $m = ud$ and $n = vd$, where $u, v \in \mathbb{Z}$.

(i) Show that u and v are coprime.

(ii) Let $k = mn/d$. Show that $k = uvd$. Show that if $m|w$ and $n|w$, for some integer w, then $k|w$. [**Hint.** Show that u and v both divide w/d and use part (a).]

(iii) Suppose that r, s are integers such that $r \equiv s \pmod{m}$ and $r \equiv s \pmod{n}$. Show that $r \equiv s \pmod{k}$.