(8)

5) ii) $PaQcRbSfSb^{-1}Rc^{-1}Qa^{-1}PeSf^{-1}SdP$ -1

One edge equation ∴ 1 face

4 vertices (P, Q, R, S)

6 edges (a, c, b, f, e, d)

$X = F - E + V$

$= 1 - 6 + 4 = -1$

We can form the boundary edges into cyclic sets as follows

$P: (da) = (a^{-1}e)$ involving boundary edges d, e

$Q: (ac) = (c^{-1}a^{-1})$

$R: (cb) = (b^{-1}c^{-1})$

$S: (bf) = (fb^{-1}) = (ef^{-1}) = (f^{-1}d)$ involving boundary edges d, e

Thus the only cyclic set is de and this is the only boundary curve of the surface ie there is one boundary curve: $B=1$

3/2

i) b) $PaPbPcPdP$

$PfPaPf^{-1}PgPhP$

$PgPbPh^{-1}P$

$PkPdPk^{-1}PcP$

Four edge equations ∴ four faces

1 vertex, P

8 edges (a, b, c, d, f, g, h, k)

$X = F - E + V$

$= 4 - 8 + 1 = -3$

We can form the boundary edges into cyclic sets as follows

$P: (ab) = (bc) = (cd) = (da) = (fa) = (af^{-1})$

$= (f^{-1}g) = (gh) = (hf) = (gb) = (bh^{-1}) = (h^{-1}g)$

$= (kd) = (dk^{-1}) = (k^{-1}c) = (ck)$

3/2

Each edge appears twice ∴ there are no boundary curves

ii)