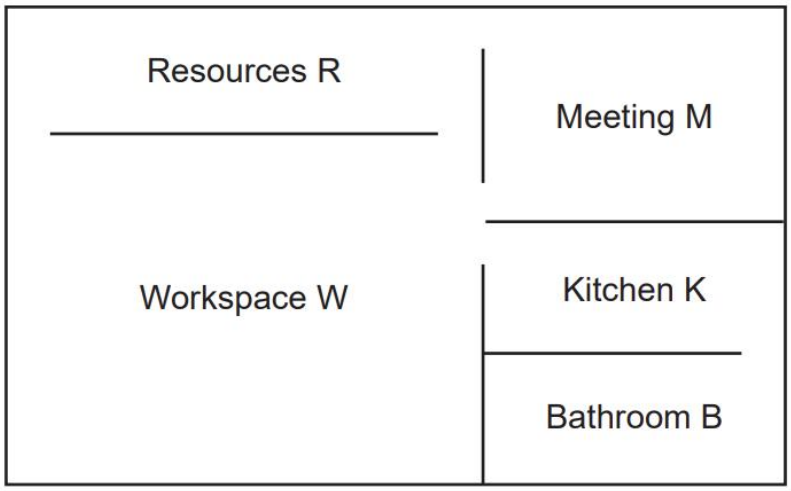
Question 6 **(8 marks)**

A small business office has five separate areas connected by doorways shown as gaps in this diagram:



This adjacency matrix below represents the number of doorways directly between each area:

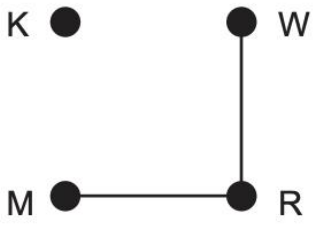
$$\begin{array}{c} \\ B \\ K \\ M \\ R \\ W \end{array} \begin{array}{c} \begin{array}{ccccc} B & K & M & R & W \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & \boldsymbol{Y} \\ 0 & \boldsymbol{X} & 1 & 2 & 0 \end{bmatrix} \end{array}$$

(a) State the meaning of the zero entries in the matrix. (1 mark)

(b) Determine the value of $\boldsymbol{X}$ and $\boldsymbol{Y}$. (2 marks)

(c) Describe how the total number of doorways for each area can be found from the adjacency matrix. (1 mark)

(d) Complete this network with vertices corresponding to the office areas and the edges representing the doorways. (3 marks)



(e) Determine how many different routes there are between the meeting room and the workspace that pass through exactly two doorways. (1 mark)