Question 1.  
(Omitted) Everyone got this question right. Well done!

Question 2.  
(a) case memory operation  
  Read hit 0 read, 0 write  
  Read miss 2 reads  
  Write hit 0 read, 1 write  
  Write miss 2 read, 1 write  
So average memory bandwidth used for each memory reference is  
\[ 75\% \cdot 5\% \cdot 2 + 25\% \cdot 95\% \cdot 1 + 25\% \cdot 5\% \cdot (2 + 1) = 0.35 \]  
Used bandwidth = \( \frac{0.35 \cdot 10^9}{10^9} = 35\% \)  

(b) case memory operation  
  any hit 0 read, 0 write  
  miss and replace clean one 2 reads  
  miss and replace dirty one 2 reads, 2 writes  
So average memory bandwidth used for each memory reference is  
\[ 5\% \cdot 70\% \cdot 2 + 5\% \cdot 30\% \cdot (2 + 2) = 0.13 \]  
Used bandwidth = \( \frac{0.13 \cdot 10^9}{10^9} = 13\% \)