Section A (1 mark per Q, 10 in total)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
e	c	c	c	e	b	a	a	g	g

Section B

1. (4 marks)
   (a) (1 mark)

$$2 \times |\mathrm{R}| \times (1 + \left\lceil log_{B-1} \left\lceil \frac{|R|}{B} \right\rceil \right\rceil = 2 \times 30 \times (1 + \left\lceil log_4 \left\lceil \frac{30}{5} \right\rceil \right\rceil = 180$$

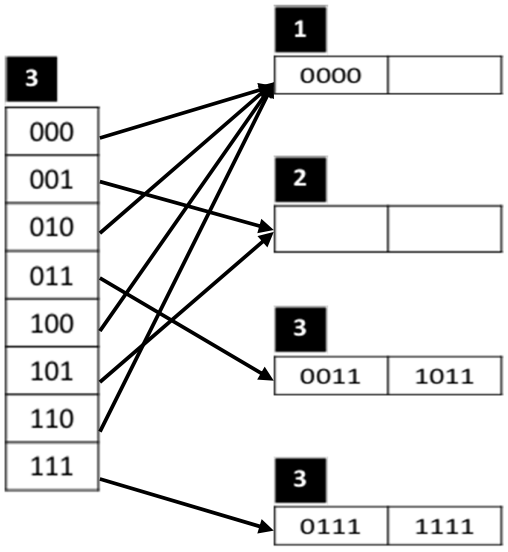
   (b) (1 mark)

   In the first pass, we should have 3 runs? 10,10,10
   In the second pass, the sorting can be completed.

   So, $2 \times |\mathrm{R}| \times 2 = 120$.

   (c) (2 marks)
   In the first pass, for read operations:
   1) fill all 5 buffers: 1 Tr + 4 Ts.
   2) other read operations are all random: |R| - 5 = 25 Tr.
   For write operations:
   3) drain all 5 buffer: 1 Tr + 4 Ts.
   4) other write operations are all random: |R| - 5 = 25 Tr.

2. (2 marks)



3. (1 mark)
   |R|+1 if max(R) < min(S)

4. (3 marks)
   (a) |R| (Scan R) + ||R|| * 3 (search on index of S.b) = 500 + 30000 = 30500
   (b) |S| (Scan S) + ||S|| * 3 (search on index of R.a) + ||R|| * 0.5 (fetch matched tuples of R) = 1000 + 30000 + 5000 = 36000
   (c) (2 + 100) * 2 + ||R|| * 0.5 = 204 + 5000 = 5204