Q3.1

For B1: misprediction rate is 0% since LARGE goes to infinity, every cycle is taken and predicted as taken.

For B2: The taken/not taken series will be:
T N N N T N N N …
Since LARGE goes to infinity, the first prediction doesn't influence the misprediction rate, then predicted series will be (from second):
- T N N N T N N …
So the misprediction rate is 50%.

For B3: similar as B2, The taken/not taken series:
T N T N …
The prediction (from second):
- T N T …
The misprediction rate is 100%.

Q3.2

For B1: is still 0%. Because the taken/not taken series:
T T T T ….
The 2-bit saturating counter:
00 01 11 11 11 …
As LARGE goes to infinity, the misprediction rate will tend to 0%.

For B2: The taken/not taken series:
T N N N T N N N …
The 2-bit saturating counter:
00 01 00 00 00 01 00 00 00, (will be 01 00 00 00…01 00 00 00…)
Thus it always predict not taken, the misprediction rate is 25%.

For B3: The taken/not taken series:
T N T N T N …
The 2-bit saturating counter:
00 01 00 01 00 01 00 …
This also always predict not taken, the misprediction rate is 50%.

Q3.3

Assume BHR is also 00 since LARGE goes to infinity, it doesn't influence the misprediction rate.

BHR	00

PHB				
B1	00	00	00	00
B2	00	00	00	00
B3	00	00	00	00
…	…			

start

BHR	00

PHB				
B1	00	00	00	00
B2	00	00	00	00
B3	00	00	00	00
…	…			

i=0, B1
Predict as N
actually T

BHR	10

PHB				
B1	01	00	00	00
B2	00	00	00	00
B3	00	00	00	00
…	…			

i=0, B1
update PHB, BHR

BHR	00

PHB				
B1	00	00	00	00
B2	00	00	00	00
B3	00	00	00	00
…	…			

i=0, B1
Predict as N
actually T

BHR	10

PHB				
B1	01	00	00	00
B2	00	00	00	00
B3	00	00	00	00
…	…			

i=0, B1
update PHB, BHR

BHR	10

PHB				
B1	01	00	00	00
B2	00	00	00	00
B3	00	00	00	00
…	…			

i=0, B2
Predict as N
actually T

BHR	11

PHB				
B1	01	00	00	00
B2	00	01	00	00
B3	00	00	00	00
…	…			

i=0, B2
update PHB, BHR

BHR	11

PHB				
B1	01	00	00	00
B2	00	01	00	00
B3	00	00	00	00
…	…			

i=0, B3
Predict as N
actually T

BHR	11

PHB				
B1	01	00	00	00
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=0, B3
update PHB, BHR

	BHR	11

PHB

B1	01	00	00	00
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=1, B1

Predict as N

actually T

	BHR	11

PHB

B1	01	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=1, B1

update PHB, BHR

	BHR	11

PHB

B1	01	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=1, B2

Predict as N

actually N

	BHR	01

PHB

B1	01	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=1, B2

update PHB, BHR

	BHR	01

PHB

B1	01	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=1, B3

Predict as N

actually N

	BHR	00

PHB

B1	01	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=1, B3

update PHB, BHR

	BHR	00

PHB

B1	01	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=2, B1

Predict as N

actually T

	BHR	10

PHB

B1	11	00	00	01
B2	00	01	00	00
B3	00	00	00	01
…	…			

i=2, B1

update PHB, BHR

	BHR	10
PHB		
B1	11	00 00 01
B2	00	01 00 00
B3	00	00 00 01
…	…	
i=2, B2		
Predict as N		
actually N		

	BHR	01
PHB		
B1	11	00 00 01
B2	00	01 00 00
B3	00	00 00 01
…	…	
i=2, B2		
update PHB, BHR		

	BHR	01
PHB		
B1	11	00 00 01
B2	00	01 00 00
B3	00	00 00 01
…	…	
i=2, B3		
Predict as N		
actually T		

	BHR	11
PHB		
B1	11	00 00 01
B2	00	01 00 00
B3	00	00 01 01
…	…	
i=2, B3		
update PHB, BHR		

	BHR	11
PHB		
B1	11	00 00 01
B2	00	01 00 00
B3	00	00 01 01
…	…	
i=3, B1		
Predict as N		
actually T		

	BHR	11
PHB		
B1	11	00 00 11
B2	00	01 00 00
B3	00	00 01 01
…	…	
i=3, B1		
update PHB, BHR		

	BHR	11
PHB		
B1	11	00 00 11
B2	00	01 00 00
B3	00	00 01 01
…	…	
i=3, B2		
Predict as N		
actually T		

	BHR	11
PHB		
B1	11	00 00 11
B2	00	01 00 00
B3	00	00 01 01
…	…	
i=3, B2		
update PHB, BHR		

We can continue do this steps via program simulation, choose LARGE=100000 we will get misprediction for B1, B2 and B3 will be 6, 25000 and 25002 respectively. Therefore, as LARGE goes to infinity, the misprediction rate for B1: 0%, B2: 25%, B3: 25%.