Sample GC problem

For this problem you will manually simulate a tracing garbage collector that uses a *conservative mark-and-sweep* algorithm to clean up allocated space. The garbage collector will perform immediate coalescing on all blocks it deallocates, and will also assume that all addresses in memory are word-aligned.

Below to the left are the values of all global and local variables in the process, and the first diagram to the right depicts the contents of the heap. You are to perform garbage collection in two steps — in step (1) shade in all the *marked* blocks, and in step (2) show the resulting heap after the *sweep* step. Note that you only need to show changed header/footer words in (2).

```
/* local vars */
int   i = 0x00EF0100;
int   j = 0xDEADBEEF;
char *p = 0x80005040;
char *q = 0x00000000;

/* global vars */
int   N    = 0x80005000;
char *GLOB = 0x80005010;
```

Current heap:

Addr.	Data
0x80005068	0x0000000D
0x...5064	0x8000504C
0x...5060	0x0000000D
0x...505c	0x00000019
0x...5058	0xFFFFFFF0
0x...5054	0x30000000
0x...5050	0x20000000
0x...504c	0x10000000
0x...5048	0x00000019
0x...5044	0x0000000D
0x...5040	0xDEADBEEF
0x...503c	0x0000000D
0x...5038	0x00000015
0x...5034	0x000000A0
0x...5030	0x64656600
0x...502c	0x60616263
0x...5028	0x00000015
0x...5024	0x0000000C
0x...5020	0x01020304
0x...501c	0x0000000C
0x...5018	0x00000011
0x...5014	0x80005064
0x...5010	0xB0B0B0B0
0x...500c	0x00000011
0x...5008	0x0000000C
0x...5004	0x80005004
0x80005000	0x0000000C

(1) Marked blocks:

Addr.	Data
0x80005068	
0x...5064	
0x...5060	
0x...505c	
0x...5058	
0x...5054	
0x...5050	
0x...504c	
0x...5048	
0x...5044	
0x...5040	
0x...503c	
0x...5038	
0x...5034	
0x...5030	
0x...502c	
0x...5028	
0x...5024	
0x...5020	
0x...501c	
0x...5018	
0x...5014	
0x...5010	
0x...500c	
0x...5008	
0x...5004	
0x80005000	

(2) After sweep:

Addr.	Data
0x80005068	
0x...5064	
0x...5060	
0x...505c	
0x...5058	
0x...5054	
0x...5050	
0x...504c	
0x...5048	
0x...5044	
0x...5040	
0x...503c	
0x...5038	
0x...5034	
0x...5030	
0x...502c	
0x...5028	
0x...5024	
0x...5020	
0x...501c	
0x...5018	
0x...5014	
0x...5010	
0x...500c	
0x...5008	
0x...5004	
0x80005000	