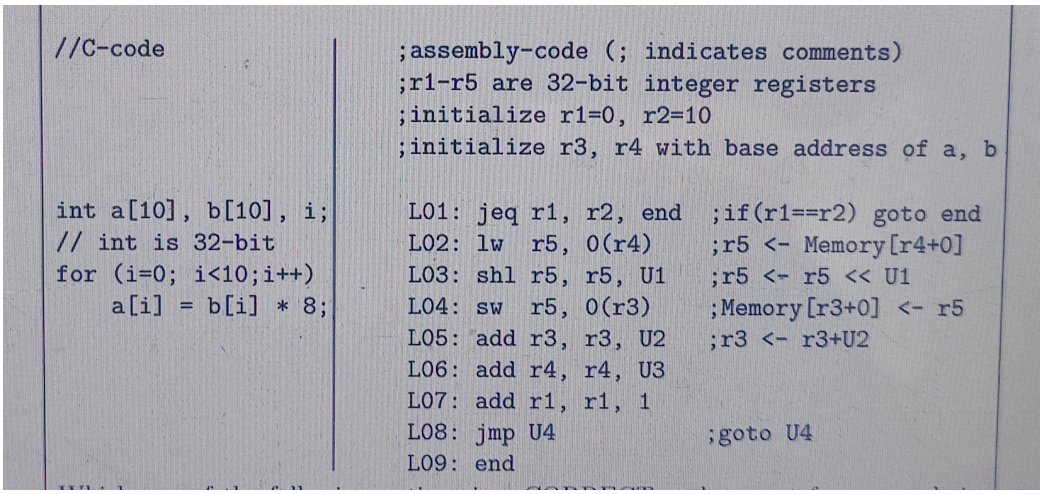
GATE 2023 Computer Science and Information Technology(CS)

November 10, 2023

1. Consider the given C-code and its corresponding assembly code, with a few operands U1-U4 being unknown. Some useful information as well as the semantics of each unique assembly instruction is annotated as inline comments in the code.



```
//C-code

int a[10], b[10], i;
// int is 32-bit
for (i=0; i<10;i++)
    a[i] = b[i] * 8;
```

```
;assembly-code (; indicates comments)
;r1-r5 are 32-bit integer registers
;initialize r1=0, r2=10
;initialize r3, r4 with base address of a, b

L01: jeq r1, r2, end   ;if(r1==r2) goto end
L02: lw  r5, 0(r4)     ;r5 <- Memory[r4+0]
L03: shl r5, r5, U1    ;r5 <- r5 << U1
L04: sw  r5, 0(r3)     ;Memory[r3+0] <- r5
L05: add r3, r3, U2    ;r3 <- r3+U2
L06: add r4, r4, U3
L07: add r1, r1, 1
L08: jmp U4            ;goto U4
L09: end
```

Figure 1: code

Which one of the following options is a CORRECT replacement for operands in the position (U1,U2,U3,U4) in the above assembly code?

(a) (8,4,1,L02)

(b) (3,4,4,L01)

(c) (8,1,1,L02)

(d) (3,1,1,L01)