

计算机体系结构 Exercise 05

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8.16. Solution: The program outputs ABCDEFGHI to the monitor. ■

9.2. Solution:

(a) The trap vector is 8-bit wide in LC-3 TRAP instruction. Thus, there can be at most $2^8 = 256$ service routines in LC-3. ■

(b) The RET instruction reloads PC with the value stored in R7 while BRnzp does not. ■

(c) First, visit the vector table in the memory and get the starting address of the service routine codes. Then set PC to the starting address, which won't visit memory. Thus, the entire process visits memory only once. ■

9.5. Solution:

"STR R0, x3007" Three operands expected. Only two operands found. Also, "x3007" is larger than the maximal immediate number accepted in LC-3 STR instruction.

Considering all registers are 0 before execution, I suppose what the programmer wants might be "MEM[x3007] ← 0".

MEM[x3004] = 'F', MEM[x3005] = 'U', MEM[x3006] = 'N', MEM[x3007] = '\0'. Thereby, the expected output is "FUN".

Thus, the instruction should be corrected as follows.

```
.ORIG x3000
LEA R0, LABEL
STR R1, R0, #3
TRAP x22
TRAP x25

LABEL .STRINGZ "FUNKY"
LABEL2 .STRINGZ "HELLO WORLD"

.END
```

The corrected program will output "FUN" to the monitor. ■

9.8. Solution:

When the value stored in A is a prime number, 1 will be stored into RESULT; otherwise, 0 will be stored into RESULT. ■

9.13. Solution: When executing B, the PC value stored by A in R7 will be overwritten. ■

9.15. Solution:

(a) TRAP x72 ■

(b) The subroutine will work. Still, there exists a potential problem, **i.e.** the value in R0 will be overwritten after the execution of the subroutine. Caller needs to prepare a backup for R0 before calling the subroutine. ■

9.19. Solution:

(a) MASK8

(b) HARDDISK

(c) END

(d) MASK4

(e) ETHERNET

(f) END

(g) MASK2

(h) PRINTER

(i) END

(j) CDROM

(k) HALT