Possible Topics of Final Problems

Digital Computer Concept and Practice
Spring, 2019
Possible Topics

• I/O
  – Memory-mapped vs. I/O instructions
  – Synchronous vs. asynchronous
  – Polling vs. interrupts

• System Calls via Trap Instructions

• Subroutines
  – JSR vs. JSRR instructions
  – Saving and restoring registers

• Stack: an Abstract Data Type

• Interrupt Service Routines
Possible Topics Cont’d

• Interpretation vs. Compilation and Its Hybrid
• High-level Programming Language
• Variables and Operators
• Control Structures
• Function
• Activation Record or Stack Frame
• Summary of LC-3 Function Call Implementation
Summary of LC-3 Function Call Implementation

1. **Caller** pushes arguments (last to first).
2. **Caller** invokes subroutine (JSR).
3. **Callee** allocates return value, pushes R7 and R5.
4. **Callee** allocates space for local variables.
5. **Callee** executes function code.
6. **Callee** stores result into return value slot.
7. **Callee** pops local vars, pops R5, pops R7.
8. **Callee** returns (JMP R7).
9. **Caller** loads return value and pops arguments.
10. **Caller** resumes computation...
Example Function Call

```c
#include <stdlib.h>

int Volta(int q, int r)
{
    int k;
    int m;
    ...
    return k;
}

int Watt(int a)
{
    int w;
    ...
    w = Volta(w,10);
    ...
    return w;
}
```

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Possible Topics Cont’d

• Type of Errors
• Source-level Debugger
• Pointers and Arrays
• Recursion Enabled by the Runtime Stack Mechanism
• Buffered I/O
• Formatted I/O
• Data Structures