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The exam has 7 questions for a total of 50 points.

Answer All Questions

1. **8pt** (4 × 2) Below are listed several computers with their data bus widths. For each computer, list the maximum unsigned integer value that can be brought into the CPU at a time (in hex),

- 1. PIC16F84 with an 8-bit data bus
- 2. IBM PS/2 with a 16-bit data bus
- 3. IBM PS/2 model 80 with a 32-bit data bus
- 4. Cray supercomputer with a 64-bit data bus

2. **12pt** (6 × 2) One or two word answer

- 1. The data bus isdirectional?
- 2. Which register of the CPU holds the address of the instruction to be fetched?
- 3. Which section of the CPU is responsible for performing addition?
- 4. Which register of the CPU holds the instruction to be executed?
- 5. In instruction "CALL K" what is the largest K that can be used on PIC 16F84?
- 6. RISC stands for?

3. **3pt** Explain Harvard architecture and how it makes processing of code and data faster.

4. **5pt** (3+2) Explain the steps for executing the instruction "CALL K" and the instruction "RETLW K".

5. (2 × 3) Assemble the following two lines of code:

```
INDF EQU 0
W EQU 0
FSR EQU 4
MOVF INDF,W
MOVWF FSR
```

6. (2+3+1) PIC 16F84 has a watchdog timer (WDT). What is its purpose and how does it work? What is the relation between the three bits in the OPTION_REG PS2, PS1, PS0 and WDT operation?

7. Write an assembly language program that reads from PORTB a number and compares this number with 50, if it is smaller than 50 then lit lamp1 else lit lamp2.

```
#include "p16f84.inc"
;*****
LIST P=16F84 ; we are using the 16F84.
ORG 0 ; org address in memory is 0
GOTO START ; goto start of program (jump over subroutines)
;*****
; Configuration Bits
__CONFIG _CP_OFF & _WDT_OFF & _PWRTE_ON & _XT_OSC ;H'3FF1'
;*****
;SETUP SECTION
START BSF STATUS,RPO ;Turns to Bank1.
MOVLW B'00011111'; bit 0 TO 4 of PORTA as I/P
MOVWF TRISA
MOVLW B'00000000'
MOVWF TRISB ;PORTB as OUTPUT
BCF STATUS,RPO ;Return to Bank0.
START ;Program starts now.
```

```
SLEEP
END ;End of your code
```