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Microcomputers I – Lab 8

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Question 1 Answer:
The program displays a counter that increments at 1x2^{13} interrupts per second at 8 Mhz.

Question 2 Answer:
dig, digit, and enableInts are the subroutine labels being advertised by the assembly.

Question 3 Answer:
The function prototype declaration enableInts is defined.

Question 4 Answer:
The "extern" key word allows C to reference a variable or information from outside the file.

Question 5 Answer:
The message displays that the array dig has not been globally declared, therefore C source files cannot access it from other files due to scope of variables.

Question 6 Answer:
It gives a warning message saying "implicit parameter declaration digit" because C does not know that digit is a subroutine/function so therefore the function call is ignored because function prototypes must be declared before the subroutine is implemented in order for C compilers to know what "digit" is.

Question 7 Answer:
void init7seg(void) is the only function prototype signatures declared in the C source file.

Question 8 Answer:
void main(void) , void init7seg(void), and interrupt subroutines PTH_ISR and RTI_ISR.

Question 9 Answer:
Some of the functions are declared and advertised in the assembly file and also declared in the header file so functions like digit and enableInts do not need prototype declarations because they are straight assembly subroutines or declared in the header file.

Question 10 Answer:
The RAM_2000 and RAM_3000 should not be labeled READ_ONLY because the RAM_3000 includes the stack range which can be written to by "pushing" onto the stack and the RAM_2000 memory range can be written to manually with MiniIDE, however since the program starts executing there, it just blocks that section of memory off for instructions.

Question 11 Answer:
The Dragon12+ board and Debug12 will not let the program load because the C source file

was compiled and linked to put the RTI vector address at $FFF0 which is an area in memory used for Debug12 configuration and is inaccessible to the user through MiniIDE.

Question 12 Answer:
The JSR instruction for enableInts() is $001F and it doesn't seem to be reasonable because this end of the memory map in the microcontroller usually contains vector address locations for various I/O ports and interrupts. Although it probably works when being linked, it is not wise to start a program at address $0000 in memory.

Question 13 Answer:
The C function call “digit(dig[i], digitx[i])” corresponds to eight lines of assembly code.

Question 14 Answer:
There are less lines of C code then assembly code because the for loops and function calls add extra assembly overhead, such as passing parameters using the right convention, etc.

Question 15 Answer:
The address is unknown because this is only the assembly translation of the main.c file which hasn't been linked yet. Therefore, the subroutine toled() does not have an address to jump too.

Question 16 Answer:
RTI_ISR = $2056
PTH_ISR = $20A6
digitx = $1100
digit = $20F6
toLED = $201F
enableInts = $211D
_Startup = $2000