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BLG 212E Microprocessor Systems Quiz 3

Question 1 (50 Points)

An ARM Cortex M0+-based microcontroller generates interrupts at a frequency of 100 Hz. The program running on the microcontroller is provided below, and no other exception handlers are triggered during the program's execution. Fill in the given table with the register values in hexadecimal just before the BX LR instruction in the interrupt handler function is executed. Assume that all other register and memory values are initialized to zero. The register values at the end of the first interrupt are provided in the table for you.

```
__main  
stop B      stop
```

```
SysTick_Handler  
    ADDS R1, #1  
    ADDS R5, #2  
    ADDS R7, #4  
    ADD  R12, R6  
    BX   LR
```

Interrupt	R1	R5	R6	R7	R12
1 st	0x05	0x1A	0x05	0x44	0x3D
2 nd	0x05	0x1C	0x05	0x48	0x3D
3 rd	0x05	0x1E	0x05	0x4C	0x3D
4 th	0x05	0x20	0x05	0x50	0x3D
5 th	0x05	0x22	0x05	0x54	0x3D
6 th	0x05	0x24	0x05	0x58	0x3D
7 th	0x05	0x26	0x05	0x5C	0x3D
8 th	0x05	0x28	0x05	0x60	0x3D
9 th	0x05	0x2A	0x05	0x64	0x3D
10 th	0x05	0x2C	0x05	0x68	0x3D
11 th	0x05	0x2E	0x05	0x6C	0x3D

Note: The ADDS and ADD instructions perform addition operations. B is an unconditional branch, and BX is a branch using the value in a register.

Question 2 (50 Points)

The ARM Cortex M0+-based microcontroller operates at a 24 MHz clock frequency. What should the RELOAD value of the System Tick Timer be to generate interrupts with a 50 ms period? Provide the reload value in decimal form.

$$T_{int} = (Load + 1) \times T_{CPU}$$

$$T_{int} = \frac{(Load + 1)}{F_{CPU}}$$

$$Load = T_{int} \times F_{CPU} - 1$$

$$Load = (50 \times 10^{-3}) \times (24 \times 10^6) - 1$$

$$Load = 1.200.000 - 1$$

$$Load = 1.199.999$$