Reg. No.



FIFTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION DECEMBER 2020/JANUARY 2021 SUBJECT: MICROPROCESSOR (ECE - 3153)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Explain the following approaches to passing parameters to subroutine with complete coding example specified for each approach:
 - i. Passing parameters by reference --- Example: To find largest among array of 8 words
 - ii. Passing parameters on the stack --- Example: To add two 32-bit numbers

Assume that the array and 32-bit numbers for the above approaches are defined in the code memory and store the result in memory in both the cases.

- 1B. Explain with a diagram why and how the link register needs to be adjusted while handling exceptions. How much is the offset value that needs to be adjusted for data abort exception?
- 1C. Explain the following assembler directives with suitable example:i. AREA directive along with its 4 important attributes ii. EXPORT

(4+3+3)

- 2A. Given that a word is stored in the memory with a variable name "NUM", write an ALP to reverse the bits and store the result as "RES" in the memory.
- 2B. Assume memory access violation occurred when a program was running in user mode. Identify the switching mode of the processor. Describe with diagram, the effect on registers during the switch-in and switch-out between the above two modes.
- 2C. Describe the following indirect memory addressing modes with example for each:
 - i. Preindex with immediate offset
 - ii. Preindex writeback with scaled register offset
 - iii. Register postindex

(4+3+3)

- 3A. With relevant diagram describe the functional block diagram of ARM7TDMI processor.
- 3B. i. Processor is executing 4 instructions of the same type in a sequence using a 3-stage pipeline (assuming that there are no interrupts or exceptions while executing). If an instruction takes 3 cycles for execution, then how many cycles are needed for executing 4 instructions?
 - ii. If the initial register contents were R0=0x00000000, R1=0x02040608, R2=0x10305070. Assume R0 is the result register, after one of the operation was performed on R1 and R2, R0 has been modified to 0x12345678. What was the operation performed on the contents of R2 and R1?

- iii. If the initial contents of R1=0x23A8C154 and R2=0x98765478, what is the contents of R3 after the following instruction?BIC R3, R1, R2
- 3C. If A and B are two 32-bit numbers stored in the consecutive memory locations, write an ALP to load these values into register and swap the register contents using EX-OR operations and store the result back in the memory. Also write an algorithm for the same.

(4+3+3)

- 4A. Describe the functions of following instructions with proper syntax and example:i. LDRSH ii. BLX iii. UMULL vi. BIC
- 4B. Draw a neat block diagram of the LPC2104 and explain the functional blocks.
- 4C. Describe the UART configuration bits in the U0LCR control register, with the help of a neat bit diagram.

(4+3+3)

- 5A. Write a C program to implement a moving average filter and apply this filter to a sinusoidal signal of 2kHz using OMAP L138. The sinusoidal signal can be generated using the lookup table method.
- 5B. With the help of functional block diagram, explain the two major subsystem of OMAP-L138 development system board.
- 5C. Write a C program to read audio signal using left channel of ADC and output the same signal at both left and right channel of DAC in OMAP L138.

(4+3+3)