

Name	Signature	Student Id Nr	Points

581305-6 Computer Organization I, miniexam 3, 2.12.2019 (12 p)

Write your answer on this exam paper in the space given. Please notice, that the exam paper is 2-sided.

Follow the recommended subroutine (function) call mechanism. TTK-91 assembly language instructions are: NOP, STORE, LOAD, IN, OUT, ADD, SUB, MUL, DIV, MOD, AND, IR, XOR, SHL, SHR, COMP, JUMP, JNEG, JZER, JPOS, JNNEG, JNZER, JNPOS, JLES, JEQU, JGRE, JNLES, JNEQU, JNGRE, CALL, EXIT, PUSH, POP, PUSHR, POPR, SVC

Integer-valued 40-element array $T[40]$ is defined at main program level. Pointer variable $ptrS$ is defined at main program level, and its value is the address of a 60-element integer array.

Integer valued function $Area(a, b)$ computes and returns as its value the area ($a*b/2$) of right-angled triangle, when the lengths of its legs (catheti) are a and b . Parameter a is call-by-value parameter and b is call-by-reference parameter.

Use the symbolic ttk-91 assembly language for answers in part (a)-(d).

a) [2 p] Give a code segment that uses a loop to print the sum of values in array T .

b) [2 p] Give a code segment that uses a loop to print the sum of values in the array pointed by $ptrS$.

c) [1 p] Give a code segment that uses function $Area()$ to print the area of right-angled triangle with legs 23 and 48.

d) [3 p] Implement function $Area(a,b)$.

e) [4 p] Hamming code. The processor reads memory using 64-bit data bus, which is bus is protected with Hamming code.

i. [1 p] How many extra (parity) bits (wires) are needed for Hamming code that *finds* and *fixes* all 1-bit errors and *finds* all 2-bit errors? Explain.

ii. [1 p] Who will set the extra bits and when? Who will check their values and when?

iii. [1 p] Assume now, that *one* bit in the data has flipped and become erroneous during data transfer for some reason. How will the system react to this? Is this a big problem? Why?

iv. [1 p] Assume now, that *three* bits in the data have flipped and become erroneous during data transfer for some reason. How will the system react to this? Is this a big problem? Why?