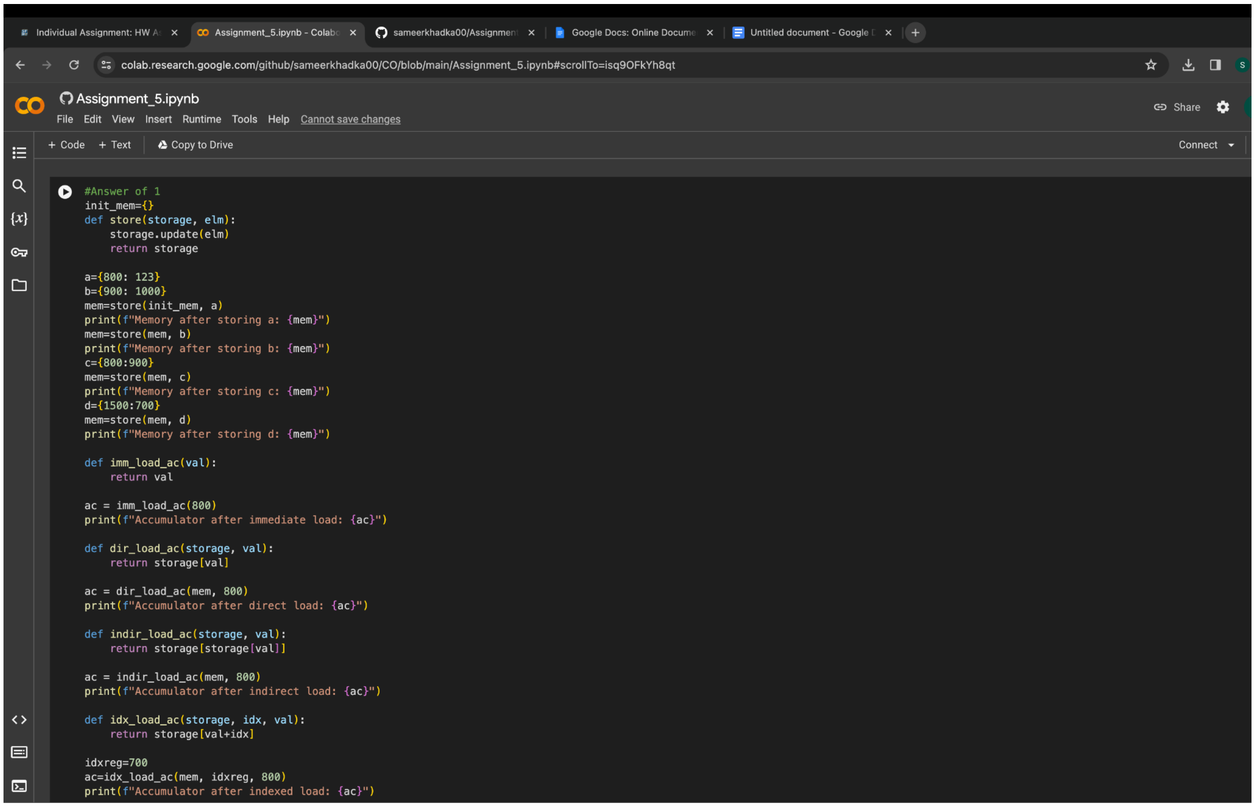
Samir Khadka(19701)
Computer Organization
Assignment 5
Answer of 1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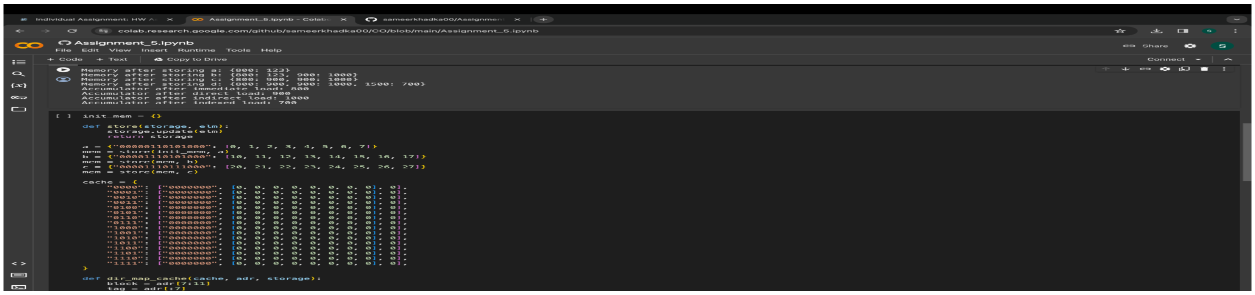
```python
#Answer of 1
init_mem={}
def store(storage, elm):
    storage.update(elm)
    return storage

a={800: 123}
b={900: 1000}
mem=store(init_mem, a)
print(f"Memory after storing a: {mem}")
mem=store(mem, b)
print(f"Memory after storing b: {mem}")
c={800:900}
mem=store(mem, c)
print(f"Memory after storing c: {mem}")
d={1500:700}
mem=store(mem, d)
print(f"Memory after storing d: {mem}")

def imm_load_ac(val):
    return val

ac = imm_load_ac(800)
print(f"Accumulator after immediate load: {ac}")

def dir_load_ac(storage, val):
    return storage[val]

ac = dir_load_ac(mem, 800)
print(f"Accumulator after direct load: {ac}")

def indir_load_ac(storage, val):
    return storage[storage[val]]

ac = indir_load_ac(mem, 800)
print(f"Accumulator after indirect load: {ac}")

def idx_load_ac(storage, idx, val):
    return storage[val+idx]

idxreg=700
ac=idx_load_ac(mem, idxreg, 800)
print(f"Accumulator after indexed load: {ac}")
```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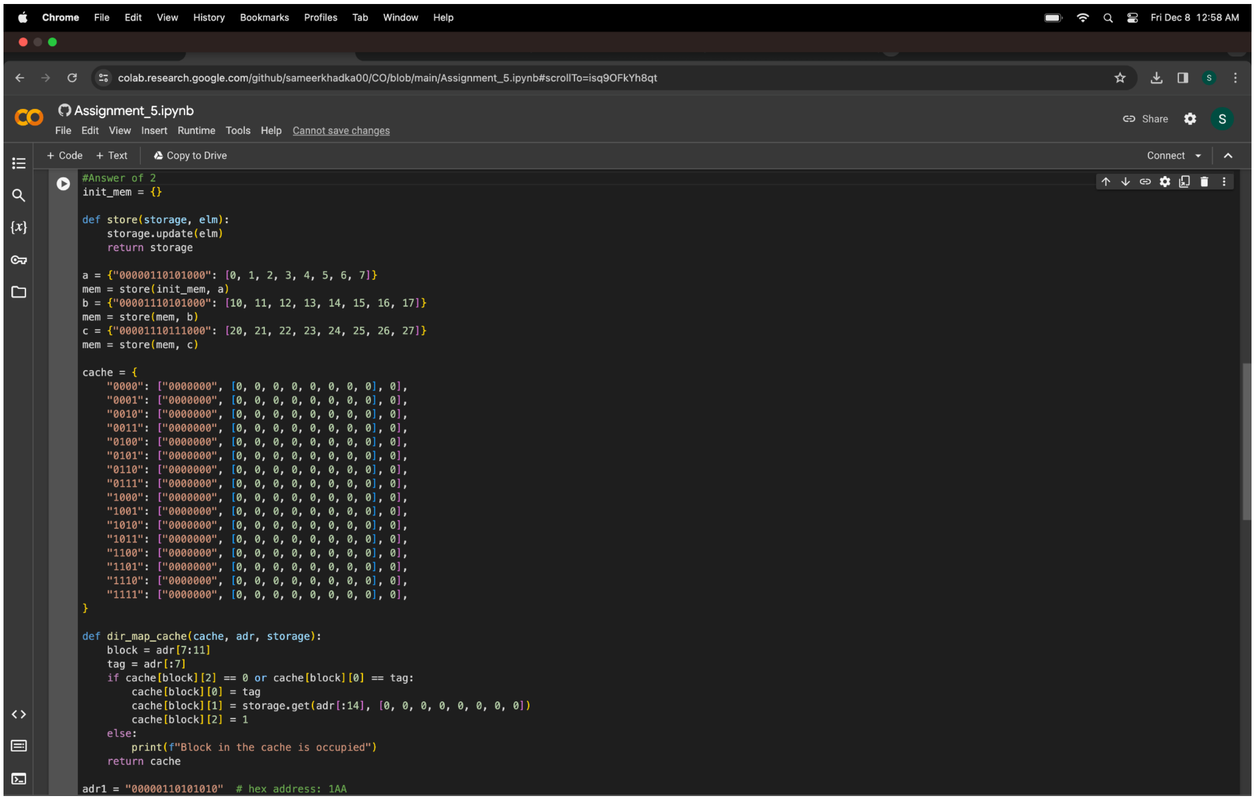
```
Memory after storing a: {800: 123}
Memory after storing b: {800: 123, 900: 1000}
Memory after storing c: {800: 900, 900: 1000}
Memory after storing d: {800: 900, 900: 1000, 1500: 700}
Accumulator after immediate load: 800
Accumulator after direct load: 900
Accumulator after indirect load: 1000
Accumulator after indexed load: 700
```

```python
init_mem = {}

def store(storage, elm):
    storage.update(elm)
    return storage

a = {"00000110101000": [0, 1, 2, 3, 4, 5, 6, 7]}
mem = store(init_mem, a)
b = {"00001110101000": [10, 11, 12, 13, 14, 15, 16, 17]}
mem = store(mem, b)
c = {"00001110111000": [20, 21, 22, 23, 24, 25, 26, 27]}
mem = store(mem, c)

cache = {
    "0000": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0001": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0010": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0011": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0100": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0101": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0110": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0111": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1000": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1001": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1010": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1011": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1100": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1101": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1110": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1111": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
}

def dir_map_cache(cache, adr, storage):
    block = adr[7:11]
    tag = adr[:7]
```

Answer of 2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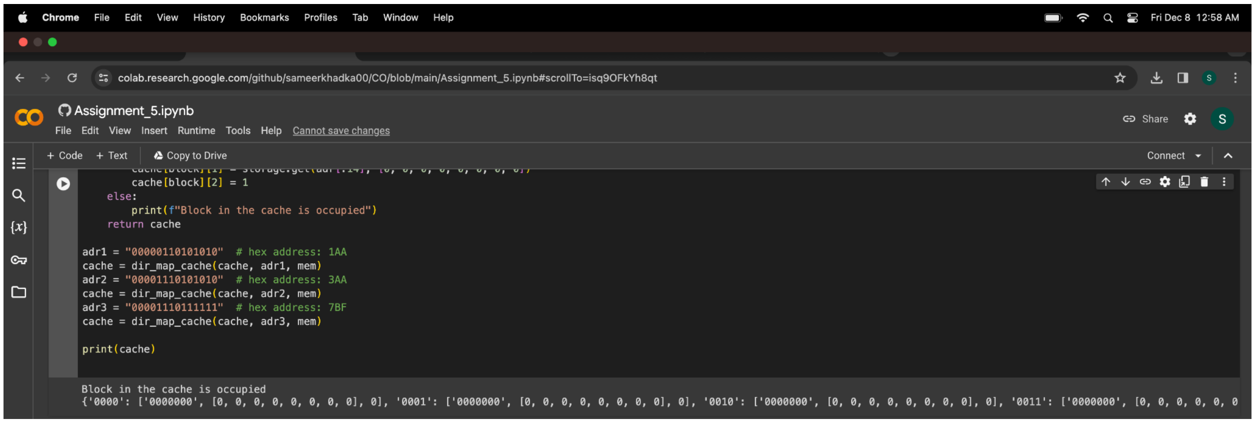
```
#Answer of 2
init_mem = {}

def store(storage, elm):
    storage.update(elm)
    return storage

a = {"00000110101000": [0, 1, 2, 3, 4, 5, 6, 7]}
mem = store(init_mem, a)
b = {"00001110101000": [10, 11, 12, 13, 14, 15, 16, 17]}
mem = store(mem, b)
c = {"00001110111000": [20, 21, 22, 23, 24, 25, 26, 27]}
mem = store(mem, c)

cache = {
    "0000": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0001": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0010": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0011": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0100": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0101": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0110": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0111": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1000": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1001": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1010": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1011": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1100": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1101": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1110": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "1111": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
}

def dir_map_cache(cache, adr, storage):
    block = adr[7:11]
    tag = adr[:7]
    if cache[block][2] == 0 or cache[block][0] == tag:
        cache[block][0] = tag
        cache[block][1] = storage.get(adr[:14], [0, 0, 0, 0, 0, 0, 0, 0])
        cache[block][2] = 1
    else:
        print(f"Block in the cache is occupied")
    return cache

adr1 = "00000110101010"  # hex address: 1AA
```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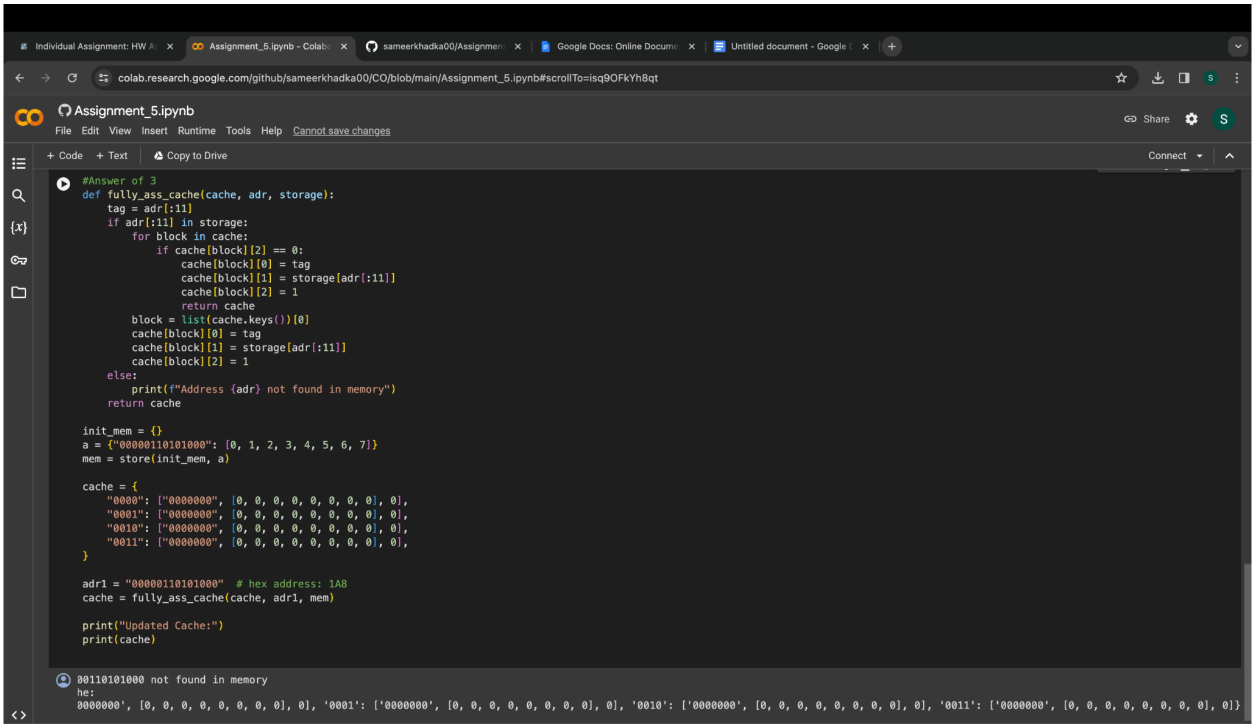
```
        cache[block][1] = storage.get(adr[:14], [0, 0, 0, 0, 0, 0, 0, 0])
        cache[block][2] = 1
    else:
        print(f"Block in the cache is occupied")
    return cache

adr1 = "00000110101010"  # hex address: 1AA
cache = dir_map_cache(cache, adr1, mem)
adr2 = "00001110101010"  # hex address: 3AA
cache = dir_map_cache(cache, adr2, mem)
adr3 = "00001110111111"  # hex address: 7BF
cache = dir_map_cache(cache, adr3, mem)

print(cache)
```

```
Block in the cache is occupied
{'0000': ['0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0], '0001': ['0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0], '0010': ['0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0], '0011': ['0000000', [0, 0, 0, 0, 0, 0
```

Answer of 3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```python
#Answer of 3
def fully_ass_cache(cache, adr, storage):
    tag = adr[:11]
    if adr[:11] in storage:
        for block in cache:
            if cache[block][2] == 0:
                cache[block][0] = tag
                cache[block][1] = storage[adr[:11]]
                cache[block][2] = 1
                return cache
        block = list(cache.keys())[0]
        cache[block][0] = tag
        cache[block][1] = storage[adr[:11]]
        cache[block][2] = 1
    else:
        print(f"Address {adr} not found in memory")
    return cache

init_mem = {}
a = {"00000110101000": [0, 1, 2, 3, 4, 5, 6, 7]}
mem = store(init_mem, a)

cache = {
    "0000": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0001": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0010": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
    "0011": ["0000000", [0, 0, 0, 0, 0, 0, 0, 0], 0],
}

adr1 = "00000110101000"  # hex address: 1A8
cache = fully_ass_cache(cache, adr1, mem)

print("Updated Cache:")
print(cache)
```

```
00110101000 not found in memory
he:
0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0], '0001': ['0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0], '0010': ['0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0], '0011': ['0000000', [0, 0, 0, 0, 0, 0, 0, 0], 0]}
```