Question-2: function calls screenshots

addEmployee

- ● NotOwner: revert

- ● Owner: successful

● OwnerWithDuplicateEmployee: revert

[vm] from:0xca3...a733c, to:Payroll.addEmployee(address,uint256) 0x692...77b3a, value:0 wei, data:0xe7f...00001, 0 logs, hash:0x5e0...9 2783   [Details] [Debug]

status	0x0 Transaction mined but execution failed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.addEmployee(address,uint256) 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	23893 gas
execution cost	1021 gas
hash	0x5e0a61a0dd82e35fe79de21199e05d4a6c3b36ac91e202e10347c8f3bfd92783
input	0xe7fd9a1300000000000000000000000014723a09acff6d2a60dcdf7aa4aff308fddc160c0000000000000000000000000000000000000000000000000000000000000001

decoded input	{
	    "address employeeId": "0x14723a09acff6d2a60dcdf7aa4aff308fddc160c",
	    "uint256 salary": "1"
	}

decoded output	{}
logs	[]
value	0 wei

caculateRunway

● FourEmployeesAndNoFund: returns 0

// total emoloyees 4, total salary 4, balance 0

[vm] from:0xca3...a733c, to:Payroll.calculateRunway() 0x692...77b3a, value:0 wei, data:0x4ec...19512, 0 logs, hash:0xa30...89f58   [Details] [Debug]

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.calculateRunway() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	22200 gas
execution cost	928 gas
hash	0xa304cae0f6062bcc29158fa1bd26609e980937ea345f0f17f6017ae1b5c89f58
input	0x4ec19512
decoded input	{}

decoded output	{
	    "0": "uint256: 0"
	}

logs	[]
value	0 wei

● FourEmployeesAnd20Balance: returns 5

// total employees 4, total salary 4, balance 20

[vm] from:0xca3...a733c, to:Payroll.calculateRunway() 0x692...77b3a, value:0 wei, data:0x4ec...19512, 0 logs, hash:0x7fb...f7b9c   [Details] [Debug]

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.calculateRunway() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	22200 gas
execution cost	928 gas
hash	0x7fb6930574a11b5269a56d535e5d979534ef2570a4d26853267c85e3e7af7b9c
input	0x4ec19512
decoded input	{}

decoded output	{
	    "0": "uint256: 5"
	}

logs	[]
value	0 wei

● TotalSalaryMoreThanBalance: returns 0

// total employees 5, total salary 40, balance 20

[vm] from:0xca3...a733c, to:Payroll.calculateRunway() 0x692...77b3a, value:0 wei, data:0x4ec...19512, 0 logs, hash:0xebc...c84e9

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.calculateRunway() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	22200 gas
execution cost	928 gas
hash	0xebcce1e2cb616c347d81e226df26a18b14ff3385b7aef66757cc9196d49c84e9
input	0x4ec19512
decoded input	{}
decoded output	{ "0": "uint256: 0" }
logs	[]
value	0 wei

hasEnoughFund

- FourEmployeesAndBeforeAddFund: returns false

// total employees 4, total salary 4, balance 0

- FourEmployeesAndAfterAddFund: returns true

// total employees 4, total salary 4, balance 20

[vm] from:0xca3...a733c, to:Payroll.hasEnoughFund() 0x692...77b3a, value:0 wei, data:0x23f...ed09e, 0 logs, hash:0xa4a...e0cce

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.hasEnoughFund() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	22231 gas
execution cost	959 gas
hash	0xa4a52cb3e1684a4dd1c86f4c936daa3559ce2055cd189d2cb7574bac581e0cce
input	0x23fed09e
decoded input	{}
decoded output	{ "0": "bool: true" }
logs	[]
value	0 wei

- TotalSalaryMoreThanBalance: returns false

// total employess 5, total salary 40, balance 20

[vm] from:0xca3...a733c, to:Payroll.hasEnoughFund() 0x692...77b3a, value:0 wei, data:0x23f...ed09e, 0 logs, hash:0x11d...00023

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.hasEnoughFund() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	22231 gas
execution cost	959 gas
hash	0x11d9234b02ba9a8a97799c256af3c0a0ddc0ec5389d3abeb8f551c47fc000023
input	0x23fed09e
decoded input	{}
decoded output	{ "0": "bool: false" }
logs	[]
value	0 wei

addFund

- Positive argument - successfully increases balance

[vm] from:0xca3...a733c, to:Payroll.addFund() 0x692...77b3a, value:10000000000000000000 wei, data:0xa2f...09dfa, 0 logs, hash:0x539...a
lce9

Details   Debug

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.addFund() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	21918 gas
execution cost	646 gas
hash	0x539516d79608397fff3b50e029e8a4ad283d9a64b70c8a01d73f363e2efa1ce9
input	0xa2f09dfa
decoded input	{}

decoded output	{
	      "0": "uint256: 30000000000000000000"
	}

logs	[]
value	10000000000000000000 wei

- Negative argument - signed integer gets stripped as unsigned integer

[vm] from:0xca3...a733c, to:Payroll.addFund() 0x692...77b3a, value:10000000000000000000 wei, data:0xa2f...09dfa, 0 logs, hash:0x2f5...0
cfaf

Details   Debug

status	0x1 Transaction mined and execution succeed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.addFund() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	21918 gas
execution cost	646 gas
hash	0x2f565adbe7bf8129c72016b8f15a4e0855f056d33e02346e14ee0c4b2e70cfaf
input	0xa2f09dfa
decoded input	{}

decoded output	{
	      "0": "uint256: 40000000000000000000"
	}

logs	[]
value	10000000000000000000 wei

getPaid

- NonEmoloyee: revert

[vm] from:0xca3...a733c, to:Payroll.getPaid() 0x692...77b3a, value:0 wei, data:0xcf4...1d6f8, 0 logs, hash:0xa68...b0984

Details   Debug

status	0x0 Transaction mined but execution failed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.getPaid() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	21892 gas
execution cost	620 gas
hash	0xa682bb1d32946bf26d661bd7eba65603a0ad7b421c53085ba2700e2a9f0b0984
input	0xcf41d6f8
decoded input	{}
decoded output	{}
logs	[]
value	0 wei

- EmployeeWithOutstandingBalance: get paid for once

[vm] from:0xca3...a733c, to:Payroll.getPaid() 0x692...77b3a, value:0 wei, data:0xcf4...1d6f8, 0 logs, hash:0xa68...b0984

Details   Debug

status	0x0 Transaction mined but execution failed
from	0xca35b7d915458ef540ade6068dfe2f44e8fa733c
to	Payroll.getPaid() 0x692a70d2e424a56d2c6c27aa97d1a86395877b3a
gas	3000000 gas
transaction cost	21892 gas
execution cost	620 gas
hash	0xa682bb1d32946bf26d661bd7eba65603a0ad7b421c53085ba2700e2a9f0b0984
input	0xcf41d6f8
decoded input	{}
decoded output	{}
logs	[]
value	0 wei

- EmployeeWithNoOutStandBalance: revert

// i.e. nextPayDate < now

```
[vm] from:0x147...c160c, to:Payroll.getPaid() 0xbbf...732db, value:0 wei, data:0xcf4...1d6f8, 0 logs, hash:0x653...f3323    Details  Debug
```

status	0x0 Transaction mined but execution failed
from	0x14723a09acff6d2a60dcdf7aa4aff308fddc160c
to	Payroll.getPaid() 0xbbf289d846208c16edc8474705c748aff07732db
gas	3000000 gas
transaction cost	22337 gas
execution cost	1065 gas
hash	0x6537aa2af91e0857ef2330fc5270dd2c609882e557d1c37e22f2b9dd172f3323
input	0xcf41d6f8
decoded input	{}
decoded output	{}
logs	[]
value	0 wei

```
transact to Payroll.getPaid errored: VM error: revert.
revert  The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.    Debug the transaction to get more information.
```

removeEmployee

- NotOwner: revert

```
[vm] from:0x4b0...4d2db, to:Payroll.removeEmployee(address) 0xbbf...732db, value:0 wei, data:0xd10...c160c, 0 logs, hash:0xa32...291d9    Details  Debug
transact to Payroll.removeEmployee errored: VM error: revert.
revert  The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.    Debug the transaction to get more information.
```

- OwnerButEmployeeNotExists: revert

```
[vm] from:0x4b0...4d2db, to:Payroll.removeEmployee(address) 0xbbf...732db, value:0 wei, data:0xd10...c160c, 0 logs, hash:0xf28...57d88    Details  Debug
transact to Payroll.removeEmployee errored: VM error: revert.
revert  The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.    Debug the transaction to get more information.
```

- OwnerAndEmployeeExists: successful removal and employee balance increases

// payment 6, balance 10

```
transact to Payroll.removeEmployee pending ...
[vm] from:0xca3...a733c, to:Payroll.removeEmployee(address) 0x692...77b3a, value:0 wei, data:0xd10...c160c, 0 logs, hash:0x742...f73ac    Details  Debug
```

- NotEnoughBalanceForPayment: revert

// payment 20, balance 10

```
[vm] from:0xca3...a733c, to:Payroll.removeEmployee(address) 0x692...77b3a, value:0 wei, data:0xd10...c160c, 0 logs, hash:0xe4f...c45de    Details  Debug
transact to Payroll.removeEmployee errored: VM error: revert.
revert  The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.    Debug the transaction to get more information.
```

updateEmployee

- NotOwner: revert

```
[vm] from:0xdd8...92148, to:Payroll.updateEmployee(address,uint256) 0x692...77b3a, value:0 wei, data:0x5e9...00002, 0 logs, hash:0x04    Details  Debug
9...c1e13
transact to Payroll.updateEmployee errored: VM error: revert.
revert  The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.    Debug the transaction to get more information.
```

- OwnerButEmployeeNotExists: revert

```
[vm] from:0xdd8...92148, to:Payroll.updateEmployee(address,uint256) 0x692...77b3a, value:0 wei, data:0x5e9...00002, 0 logs, hash:0x99    Details  Debug
a...1abf4
transact to Payroll.updateEmployee errored: VM error: revert.
revert  The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.    Debug the transaction to get more information.
```

- NotEnoughBalanceForPayment: revert

[vm] from:0xca3...a733c, to:Payroll.updateEmployee(address,uint256) 0x692...77b3a, value:0 wei, data:0x5e9...00014, 0 logs, hash:0xc8 1...92c78

transact to Payroll.updateEmployee errored: VM error: revert.
revert The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.   Debug the transaction to get more information.

- SuccssfulUpdateSalary: successful

transact to Payroll.updateEmployee pending ...

[vm] from:0xca3...a733c, to:Payroll.updateEmployee(address,uint256) 0x692...77b3a, value:0 wei, data:0x5e9...00002, 0 logs, hash:0x5f d...76d91

changePaymentAddress

- NotOwner: revert

[vm] from:0x583...40225, to:Payroll.changePaymentAddress(address,address) 0x692...77b3a, value:0 wei, data:0xbc4...4d2db, 0 logs, hash: 0xf2a...c4bdb

transact to Payroll.changePaymentAddress errored: VM error: revert.
revert The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.   Debug the transaction to get more information.

- EmployeeNotExists: revert

[vm] from:0xca3...a733c, to:Payroll.changePaymentAddress(address,address) 0x692...77b3a, value:0 wei, data:0xbc4...4d2db, 0 logs, hash: 0xb83...bbd4a

transact to Payroll.changePaymentAddress errored: VM error: revert.
revert The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.   Debug the transaction to get more information.

- NewAddressExists: revert

[vm] from:0xca3...a733c, to:Payroll.changePaymentAddress(address,address) 0x692...77b3a, value:0 wei, data:0xbc4...4d2db, 0 logs, hash: 0xa96...c9bf2

transact to Payroll.changePaymentAddress errored: VM error: revert.
revert The transaction has been reverted to the initial state.
Note: The constructor should be payable if you send value.   Debug the transaction to get more information.
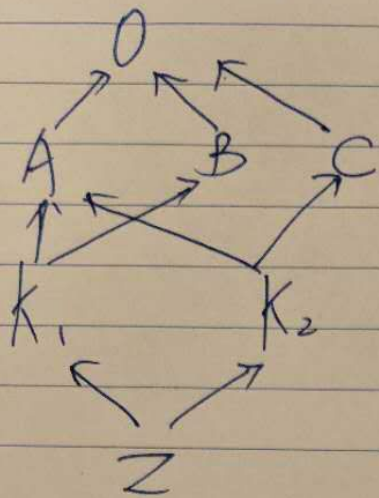
- SuccessfulChangeAddress: balance remains the same

[vm] from:0xca3...a733c, to:Payroll.changePaymentAddress(address,address) 0x692...77b3a, value:0 wei, data:0xbc4...4d1db, 0 logs, hash: 0x714...bdd27

Question-3: inheritance path of Z

L[Z] = Z-K2-C-A-K1-B-O

$$L[O] = O$$

$$L[C] = C + merge(L[O], O)$$
$$= C + merge(O, O)$$
$$= CO$$

$$L[B] = B + merge(L[O], O)$$
$$= BO$$

$$L[A] = A + merge(L[O], O)$$
$$= AO$$

$$L[K_2] = K_2 + merge(L[C], L[A])$$
$$= K_2 + merge(CO, AO)$$
$$= K_2 + C + A + O$$
$$= K_2 CAO$$

$$L[K_1] = K_1 + merge(L[B], L[A])$$
$$= K_1 + merge(BO, AO)$$
$$= K_1 + B + A + O$$
$$= K_1 BAO$$

$$L[Z] = Z + merge(L[K_2], L[K_1])$$
$$= Z + merge(K_2 CAO, K_1 BAO)$$
$$= Z + K_2 + merge(CAO, K_1 BAO)$$
$$= Z + K_2 + C + merge(AO, K_1 BAO)$$
$$= Z + K_2 + C + A + merge(O, K_1 BO)$$
$$= Z + K_2 + C + A + K_1 + merge(O, BO)$$
$$= Z + K_2 + C + A + K_1 + B + merge(O, O)$$
$$= Z K_2 CA K_1 BO$$