Test 2 Questions

Question 1

Which of the following statement/statements is/are CORRECT?
a)   The "nonce" is an algorithm to regulate the generation rate of a new block
b)   A miner is a computer that collects transactions and organizes them into blocks
c)   Orphan blocks are invalid blocks that have been rejected by the chain
d)   A blockchain is a centralized ledger on a peer-to-peer network

Suggested reasons

a)   Wrong, nonce is a counter used for proof-of-work algorithm
b)   Correct, validate new transactions and record them on the global ledger
c)   Wrong, orphan blocks are valid blocks that have been rejected by the longest chain or heaviest chain algorithm.
d)   Wrong, decentralized

So b is picked

Question 2

What is the maximum number of transaction(s) is/are allowed in a Blockchain block?
a)   Only one transaction
b)   Two transactions
c)   There is no maximum number of transactions, except that it requires a power of 2, for example, 2, 4, 8, 16, etc.
d)   None of the above

Suggested reasons

- The maximum number of transactions in a block depends on the maximum size of a block, which you can configure in MultiChain to be up to 1 GB in size.

  So, d) is picked

Question 3

What of the following statements about stocks and bonds are correct?

a) Bonds give the holder partial ownership in a corporation but not stocks.
b) Bonds are a kind of debt instruments but not stocks
c) Stocks can provide a steadier source of regular income than bonds
d) The liquidity of stocks and bonds is lower than cash

Suggested reasons

a) Wrong, stocks give the holder partial ownership in a corporation but not bond
b) Correct, bonds are a kind of debt instruments but stocks are a kind of financial instruments
c) Wrong, Bond can provide a steady source of regular income but stocks may vary significantly by time.
d) Correct, the liquidity of stocks and bonds is lower than cash, as cash is the most liquidity in the market.

Question 4

What is the Present Value (PV) and Yield to Maturity (YTM) of a simple loan if its future value (FV) after five years is $1000? Given the annual interest rate is 10% and interests is paid twice per year. Show the works in the text box provided below.

Suggested solution:

PV = $1000 / (1 + 0.05)^10 = $613.9;

YTM = (FV-PV)/PV*100% = (1000-613.9)/613.9*100% = 62.9%
FV = $1000, np = 10, I = 0.1/2 = 0.05, PMT = 0
PV = np1.pv(I, np, PMT, FV) = np1.pv(0.05, 10, 0, 1000) = -613.9
YTM = (FV – PV)/PV*100% = 62.9%

```
import numpy_financial as np1
fv = 1000
np = 10
I = 0.05
pv = np1.pv(I, np, 0, fv)
print ("PV = ", pv)
YTM = (fv - abs(pv))/abs(pv)*100
print ("YTM = ", YTM)
```

Question 5

Which of the following is/are debt instrument(s)? Explain the reason(s) for your choice based on the debt instrument's nature in the text box provided below.

a) Bond
b) Leases
c) Cash
d) Cheque

Suggested reasons

Debt instruments are assets that require a fixed payment to the holder, usually with interest

bond and leases are the debt instrument

For option cash and Cheque, they are not debt, cash is clear and Cheque is basically cash. So, they won't be debt instrument.

Question 6

Which of the following(s) is(are) qualified as a financial intermediary?

a) Fund manager
b) Insurance Companies
c) Restaurant
d) HKTVmall

Suggested reasons

a) Correct, funder manager collect money for saver, and make loan/investments with borrowers, p.16
b) Correct, insurance companies receive funds from policy premiums, and invest in less liquid corporate securities and mortgages
c) Incorrect, Restaurant is just a trading activities of services with customers, there is no borrow/loan activates between them
d) Incorrect, HKTVMall is just a trading activities of goods with customers, there is no borrow/loan activates between them

Question 7

Apply Merkle Tree approach to determine the ROOT hash value of the following five transactions using sha256. How many hash operations are needed to determine the root hash value?

Transaction 1 "Bob paid Mary HK$500"

Transaction 2 "Mary paid Jimmy HK$100"

Transaction 3 "Jimmy paid Tom HK$1000"

Transaction 4 "Tom paid Jimmy HK$300"

Transaction 5 "Jimmy paid Mary HK$50"

Suggested solution:

```python
import hashlib

def sha256(message):
    encoded_message = message.encode('ascii')
    hashed_output = hashlib.sha256(encoded_message)
    return hashed_output.hexdigest()


H1 = sha256("Bob paid Mary HK$500")
H2 = sha256("Mary paid Jimmy HK$100")
H3 = sha256("Jimmy paid Tom HK$1000")
H4 = sha256("Tom paid Jimmy HK$300")
H5 = sha256("Jimmy paid Mary HK$50")


H12 = sha256(H1+H2)
H34 = sha256(H3+H4)
H55 = sha256(H5+H5)


H1234 = sha256(H12+H34)
H5555 = sha256(H5+H5)


H12345555 = sha256(H1234+H5555)
print (H12345555)
```
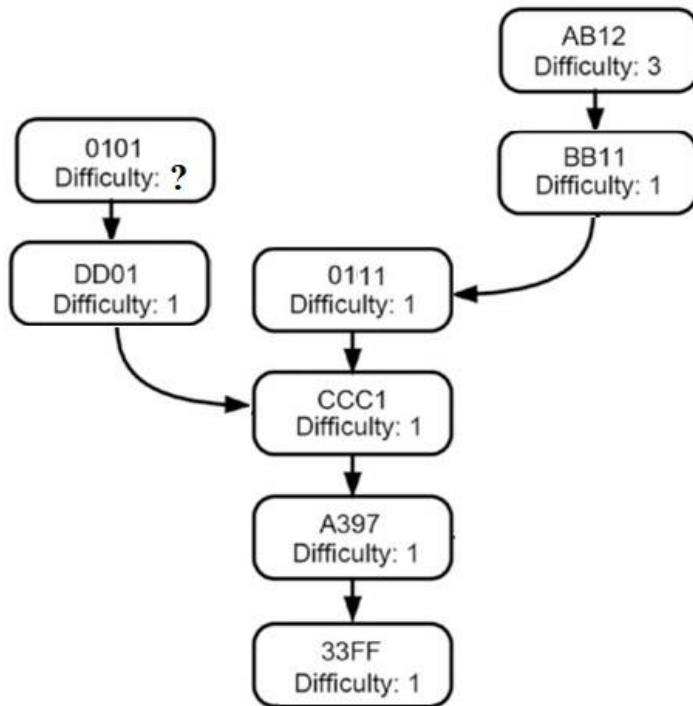
No of hash operations = 11

ROOT Hash value:

04182812e90196e7e815b201b21c01808b6c50a679744df1ef689f26daba202d

Question 8

For the figure shown below, what should be the minimum difficulty set for block 0101 to make it accepted as part of the authoritative blockchain? Under this situation, what is/are the orphan block(s)?

Suggested solution:

Difficulty 5

Orphan block: AB12, BB11, 0111