Name: Department: Student ID:

1. (10%) Write down the output of the program
   A.

```
>>> range(3, 17, 7)

>>> [3, 10]
```

   B.

```
>>> range(2, -8, -3)

>>> [2, -1, -4, -7]
```

2. (30%) Tuples, Lists, Dictionaries
   A.

```
>>> a = (['Alice'], ('Alice', ['Alice']), ['Alice', ('Alice')], 'Alice', {'name': 'Alice'})
```

   Please replace ‘Alice’ with ‘Bob’ as many as you can, and write down your answer without creating a new variable. (you don’t have to write down how you change them)

```
>>> a

>>> (['Bob'], ('Alice', ['Bob']), ['Bob', 'Bob'], 'Alice', {'name': 'Bob'})
```

   B.

```
>>> b = range(30)
>>> [ i-1 for i in b if i % 3 is 0 ]

>>> [-1, 2, 5, 8, 11, 14, 17, 20, 23, 26]
```

   C.

```
>>> fruits = ['apple', 'mango', 'banana','cherry']
>>> { f : len( f ) for f in fruits }

>>> {'cherry': 6, 'mango': 5, 'apple': 5, 'banana': 6}
```

3. (20 %) List comprehensive

A.

```
>>> args = [3,9,2]
>>> [(x, y) for x in range(*args) for y in [3,4,5] if x != y]

>>> [(3, 4), (3, 5), (5, 3), (5, 4), (7, 3), (7, 4), (7, 5)]
```

B.

```
>>> matrix = [
...         [1,2,3,4],
...         [5,6,7,8],
...         [9,10,11,12]
...    ]
>>> [[ row[ i ] for row in matrix] for i in range( 4 )]

>>> [[1, 5, 9], [2, 6, 10], [3, 7, 11], [4, 8, 12]]
```

4. (20%) Write down the output of the function

A.

```
>>> def f( n ):
...         result = [ ]
...         a, b = 1, 2
...         while a < n:
...                 result.append( a )
...                 a, b = b, a * b
...         return result
>>> f( 1000 )

>>> [1, 2, 2, 4, 8, 32, 256]
```

B.

```
>>> def f( n ):
...          return ( n <= 0 ) ? 0 : ( n + f( n-1 ) )
>>> f ( 10 )

>>> 55
```

5. (10%) Write down a proof of work function

```
>>> def proof_of_work( index, data ):
...         max_nonce = 2 ** 32
...         target = 2 ** 240
...         for nonce in xrange(max_nonce):
...             hash_result = hashlib.sha256(str(index)+
...                                          str(data)+
...                                          str(nonce)).hexdigest( )
...             if long(hash_result, 16) < target:
...                 return (hash_result, nonce)
...
...
...
...
...
...
...
...
...
...
...
...
...
...
...
```

6. (10%) What is blockchain ? What is its advantage ?

區塊鏈是去中心化、不可篡改的分散式帳本系統，利用密碼學以及工作量證明的共識演算法來解決網路的信任問題

他的優勢為可以在不需要第三方信任機構的情形下讓網路上的每個人可以傳送交易，提升網路的效率．同時他又有著去中心化、對每個人開放、公開透明以及安全(在沒有人可以掌握51%算力的情形下)