Assignment -1

Q1:

OSI model has seven layers which are Application layer, Presentation layer, Session layer, Transport layer, Network layer, Link layer and Physical layer. While TCP/IP model only have five layers which are Application layer, Transport layer, Network layer, Link layer and Physical layer.

Application layer is where network applications and their application-layer protocols reside.

Transport layer transports application-layer messages between application endpoints.

Network layer is responsible for moving network-layer packets known as datagrams from one host to another.

The Internet's network layer routes a datagram through a series of routers between the source and destination. To move a packet from one node (host or router) to the next node in the route, the network layer relies on the services of the link layer.

Physical layer moves the individual bits within the frame from one node to the next.

Q2:

Circuit switching is better. While the application need to run a long period of time with a steady state, the reliability of circuit switching is much better than packet switching. The end-to-end delays are variable and unpredictable (due primarily to variable and unpredictable queuing delays).

Q3:

a) 150 / 5 + 150 / 5 + 150 / 5 = 90

The total time to send the data from Source to Destination assuming no segmentation is 90 seconds.

b) (150 / 10) / 5 = 3

If the message is split into 10 equal segments, it will take 3 seconds for the first packet to travel from Source to the FIRST switch

(150 / 10) / 5 = 3

3 seconds after the first packet begins moving from the first switch to the second switch will the second packet be fully received at the first switch.

c) ((150 / 10) / 5) * 3 + ((150 / 10) / 5) * 9 = 36

It takes 36 seconds to move the file from source host to destination host when message segmentation is used. It's 54 seconds shorter than which message segmentation is not used.

d) The propagation delay will be doubled and the other delays will not be affected.

e) Message segmentation has variable and unpredictable end-to-end delays (due primarily to variable and unpredictable queuing delays).

When it comes to high speed data transmission, the hardware will be much more complex than circuit switching.

It offers better sharing of transmission capacity than circuit switching.

It is simpler, more efficient, and less costly to implement than circuit switching.

Q4:

IP address is the final destination address and it won't change during the transmission. MAC

address is the physical address of the next switch.
Through using IP address and MAC address, we can separate the protocol layers and make the use of protocols more flexible.

Q5:
Code:

```
def JudgePrime(num):
    if num > 1:
        for i in range(2, num):
            if (num % i) == 0:
                print(num, " is not a prime number")
                break
        else:
            print(num, "is a prime number")
    else:
        print(num, " is not a prime number")

while True:
    num = int(input("Type in a number, type in \"-1\" to quit: "))
    if num == -1:
        break
    else:
        JudgePrime(num)
```

Output:

```
Type in a number, type in "-1" to quit: 1
1  is not a prime number
Type in a number, type in "-1" to quit: 2
2 is a prime number
Type in a number, type in "-1" to quit: 6
6  is not a prime number
Type in a number, type in "-1" to quit: 258
258  is not a prime number
Type in a number, type in "-1" to quit: -1

Process finished with exit code 0
```

Q6:
Code:

```
def JudgePalindrome(InputString):
    IS = []
    for i in range(0, int(len(InputString))):
        if InputString[i] != " ":
```

```
            IS.append(InputString[i])
    flag = True
    for i in range(0, int(len(IS) / 2)):
        if IS[i] == IS[len(IS) - i - 1]:
            flag = True
        else:
            flag = False
            break
    if flag:
        print("\"" + InputString + "\"" + " is a Palindrome")
    else:
        print("\"" + InputString + "\"" + " is not a Palindrome")

while True:
    InputString = input("Please enter a sentence or a word (Enter \"Quit\" to leave): ")
    if InputString == "Quit":
        break
    else:
        JudgePalindrome(InputString)
```

Output:

```
Please enter a sentence or a word (Enter "Quit" to leave): no melon, no lemon
"no melon, no lemon" is a Palindrome
Please enter a sentence or a word (Enter "Quit" to leave): This is not a palindrome!
"This is not a palindrome!" is not a Palindrome
Please enter a sentence or a word (Enter "Quit" to leave): Quit

Process finished with exit code 0
```

Q7:

a) (1.5 * 1024 * 1024 * 15000 * 1000) / (2.2 * 10^8) ≈10^5 b

The bandwidth-delay product is about 10^5 bits.

b) The maximum number of bits that will be in the link at any given time is 10^5 bits

c) Bandwidth-delay product is the maximum number of bits that will be in the link at any given time.

d) 15000 * 1000 / (10^5) = 150 m

The width of a bit in the link is 150 meter which is much longer than a football field

e) suppose w is the width of a bit

w = m / ((m * R) / s) = s / R

The general expression for the width of a bit in terms of the propagation speed s, the transmission rate R, and the length of the link m is (s / R).