Unit 6 · Clients, Servers and the Web

WORKSHEET

Full marks 34

Name _____ Class _____ Roll no. ____ Date _____ Marks _____ / 34

1 Key words [4]

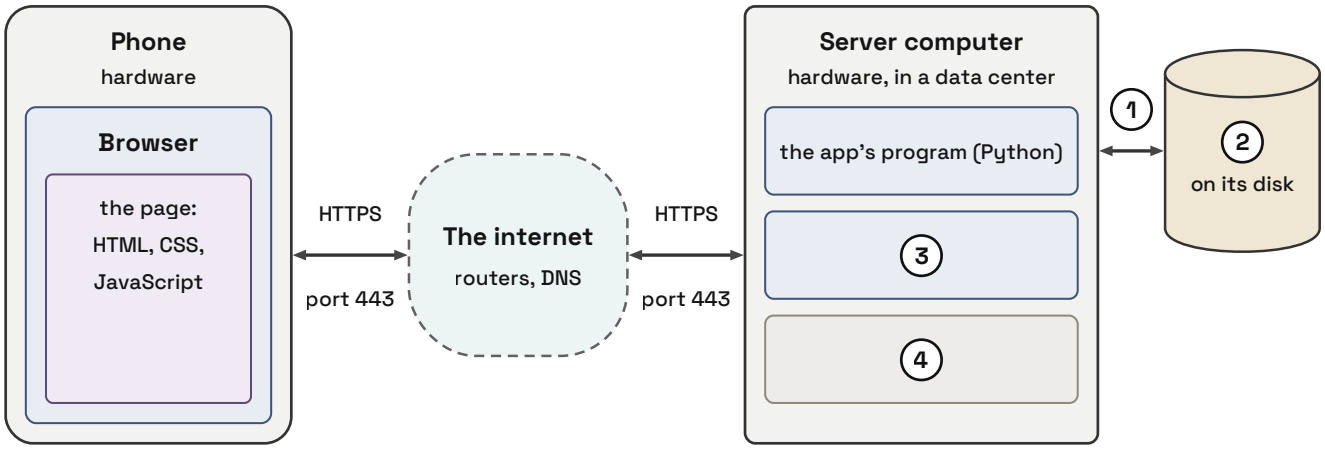
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

acknowledgment	**certificate authority**	**cookie**	**encapsulation**	**MAC address**	**port number**
router	**server**	**socket**	**stateless**		

The program that waits for requests and answers them is the _____. Each layer adding a header of its own in front of the data, on its way down, is called _____. A _____ says which program on a computer a segment is for, and an IP address with a port is a _____. TCP's _____ number names the next byte the receiver wants. HTTP is _____: the server remembers nothing between one request and the next, so a website keeps you signed in with a _____ that holds a session ID. A _____ checks that whoever asks for a certificate really controls the name, then signs it.

2 Label the diagram [2]

The diagram shows the parts of the lost-and-found board. Write the word or words that belong in place of 1 to 4. Each carries 0.5 mark.



1. _____ 2. _____

3. _____ 4. _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. A packet leaves a phone with a TTL of 64 and passes through 12 routers before it reaches the server. What is its TTL when it arrives? [1]

a. 64 **b.** 52
c. 12 **d.** 76

ii. A receiver has all the bytes up to 4,800 and is missing 4,801 to 5,300, but has received 5,301 to 5,800. What acknowledgment does it send? [1]

a. ACK 5801 **b.** ACK 4801
c. ACK 5301 **d.** ACK 4800

iii. A program sends a request and gets **503 Service Unavailable.** What should it do? [1]

a. Change the request: it was written wrongly.
b. Try the same request again later: the server is busy or down for now.
c. Give up for ever: the address doesn't exist.
d. Sign in and try again.

iv. Which of these is valid JSON? [1]

a. `{'district': 'Ilam'}`
b. `{"district": "Ilam",}`
c. `{"district": "Ilam", "tea": true, "rank": null}`
d. `{"district": "Ilam", "tea": True}`

v. A table **bookings** has the key booking_id and the fields bus_no, travel_date, seat, driver_name, where each bus has one driver. Which normal form does it break? [1]

a. 1NF
b. 2NF
c. 3NF: driver_name depends on bus_no, which isn't the key
d. none

4 What does it print? [3]

Write exactly what the program prints, in the box under it.

```
1 import json
2
3 item = {"what": "a pen", "found": True, "photo": None, "size": (1, 14)}
4 text = json.dumps(item)
5 print(text)
6 back = json.loads(text)
7 print(back["size"], back == item)
```

OUTPUT

5 Trace the program [4]

Fill in the trace table: one row for each time round the loop. `ord(ch)` gives a letter's ASCII code, and `format(n, "07b")` writes a number as 7 binary digits.

This program adds an even parity bit in front of each letter.

```
for ch in "NEP":
    bits = format(ord(ch), "07b")
    ones = bits.count("1")
    parity = ones % 2
    print(ch, str(parity) + bits)
```

ch	bits	ones	parity	Output

6 Find and fix the bug [3]

Read the program, then answer.

The server checks each item sent to it before saving it. It prints `None` for the first item, then stops with an error.

```
LONGEST = {"what": 60, "place": 40}

def problem(item):
    for key, longest in LONGEST.items():
        value = item[key]
        if not value.strip():
            return key + " must be some text."
        if len(value) > longest:
            return key + " is too long."
    return None

print(problem({"what": "a pen", "place": "Room 4"}))
print(problem({"what": "a calculator"}))
```

i. Which line stops the program, and with which error?

ii. On a real server, what status code would the client get, and what should it have got?

iii. Write the corrected line.

7 Write a program [4]

Write the program in Python on the lines. Any program that gives the right result gets the marks.

The server answered `GET /items` with this text, already in the variable **text**:
`'[{"what": "a pen", "place": "Room 4"}, {"what": "an umbrella", "place": "the gate"}, {"what": "a ruler", "place": "Room 4"}]'`
Write a program that reads it as JSON, prints each place with the number of items found there, then the place with the most items. For this text it should print `Room 4 2`, `the gate 1` and `Most: Room 4`.

8 Long answer [4]

Write a long answer to the following question.

A bus company keeps this table of tickets: **tickets** (ticket_no, seat, travel_date, bus_no, route, driver, driver_phone, passenger_name, passenger_phone). Each bus always runs one route with one driver.

a. Identify one update anomaly, one insertion anomaly and one deletion anomaly this table allows.
b. Normalize it to third normal form. Write each table with its primary key, its foreign keys, and the normal form each step reaches.
c. Explain how referential integrity protects the new design.

9 Segments and acknowledgments [3]

Read the question, then answer.

A message of 2,400 bytes is sent by TCP in three segments of 800 bytes, starting at sequence number 3001. The **first** segment is lost the first time; the other two arrive. Write down, in order, each segment sent and each acknowledgment the receiver sends, until everything has arrived.

10 Think [2]

Think, then answer.

The internet's routers only pass packets on; reliability, encryption and the meaning of the data are left to the computers at the ends. Why did this make it possible for anyone to invent the web, a payment app or a video call? Give one price the internet pays for it.

11 Activity: Read real requests (not marked)

At a computer with Chrome, Edge or Firefox, open a website, press **F12** and choose the **Network** tab. Load the page again. Fill in the table for four requests, including one whose type is **fetch** or **xhr**, and one whose status isn't 200.

Request (path)	Method	Status code	Content-Type of the response