

Last name: First Name:

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VICTORIA UNIVERSITY OF
WELLINGTON
TE HERENGA WAKA

**TRIMESTER II
TERM TEST I – 2022**

NWEN304

Advanced Network Applications

Time Allowed: 50 MINUTES

CLOSED BOOK

Permitted materials: Only silent non-programmable calculators or silent programmable calculators with their memories cleared are permitted in this test. No electronic dictionaries are allowed.

Instructions: Attempt ALL **TWENTY One(21)** questions.

There are three sections:

- SECTION A - True/False [10 marks]
- SECTION B - Multiple Choice [20 marks]
- SECTION C - Short ANSWERS [20 marks]

The test consists of 50 marks in total.

You must write your answers in the boxes provided within the questionnaire.

SECTION A State True or False (10 marks)

Instructions: There are 5 questions in this section. Each question is worth 2 marks.

1. A user requests a Web page that contains some text, a link to a CSS file and another link to a JavaScript file. For this page, the client will send one request message and receive four response messages.

- a. True
- b. False

False

2. Once a persistent connection has been established between a client and the server, multiple distinct web pages can be sent over the same connection.

- a. True
- b. False

True

3. A one-way asynchronous RPC call to a remote service is *temporally* coupled to the service.

- a. True
- b. False

True

4. During the execution of the following Node.js code segment, the main thread process sleeps while the function `setTimeout` executes.

```
let http=require('http');
let s = http.createServer(function(req,res){
    res.writeHead(200,{ 'content-type': 'text/plain' });
    res.write('Hello\n');
    setTimeout(()=>{res.end("world\n")},2000);
});

s.listen(3000);
```

- a. True
- b. False

False

5. HTTP response messages can never have an empty message body.

- a. True
- b. False

False

SECTION B Multiple choice questions (20 marks)

Instructions: There are 10 questions in this section. Each question is worth 2 marks.

6. Which of the following network applications have the characteristics of being - tolerant to data loss, bandwidth-sensitive and time-sensitive.
- a. E-mail
 - b. Interactive gaming
 - c. File transfer
 - d. Web based documents

b

7. Which of the following version of HTTP protocol is based on UDP.

- a. HTTP/0.9
- b. HTTP/1.1
- c. HTTP/2
- d. HTTP/3

d

8. Which of the following tasks are preferred to be done asynchronously?

- a. I / O
- b. Downloading a remote file
- c. API call
- d. All the above

d

9. Ability of a client to access a resource from different locations is an example of which of the following distribution transparency?

- a. Location transparency
- b. Relocation transparency
- c. Migration transparency
- d. All the above

c

10. Fill in the blank. Fetch API is exposed by _____.

- a. Web Browser
- b. Operating System
- c. HTTP protocol
- d. None of the above

a

11. What is the role of a rendering engine in a browser?

- a. Parse HTML document to construct a DOM tree
- b. Parse CSS files to create a CSSOM tree
- c. Combine DOM and CSSOM trees to form a Render tree
- d. All of the above

d

12. Which of the following header fields is used to request persistent/non-persistent HTTP connections.

- a. Age
- b. Expire
- c. Connection
- d. Connection-Encoding

c

13. Which of the following web resources *can* be render blocking?

- i. CSS
 - ii. JavaScript
 - iii. Images
 - iv. Media files
-
- a. ii Only
 - b. i Only
 - c. i and ii Only
 - d. i, ii and iii Only

c

14. Under which of the following cases does the `<script>` tag does **not** block rendering.

- i. `<script>` tag at the bottom of a web page
 - ii. `<script>` tag in the head of a web page
 - iii. `<script>` tag set with `defer` attribute in the head of a web page
 - iv. `<script>` tag set with `async` attribute in the head of a web page
-
- a. i Only
 - b. i and iii Only
 - c. i, iv Only
 - d. i, iii and iv Only

b

15. Select **all** valid statements.

- i. RESTful services may not always require HTTP protocol.
- ii. In Node.js, on completion of a network request the associated callback gets immediately pushed onto the call stack by the event loop.
- iii. In JavaScript, functions can have properties and methods.
- iv. in HTTP/1.1, the server needs to maintain the response order as requested by the client.

- a. i, iv Only
- b. i, iii Only
- c. i,ii and iii Only
- d. i,iii and iv Only

d

SECTION C Short Answer Questions (20 marks)

Instructions: There are 6 questions in this section. Marks for questions in this section are included with the question.

16. What does it mean for a HTTP request method to be idempotent?

(2 marks)

An HTTP method is idempotent if an identical request can be made once or several times in a row with the same effect while leaving the server in the same state. In other words, an idempotent method should not have any side effects — unless those side effects are also idempotent.

GET, HEAD, PUT, and DELETE methods are idempotent, but not the POST method.

17. Explain the difference between network architecture and application architecture.
(3 marks)

Network architecture refers to the organization of the communication process into layers (e.g., the five-layer Internet architecture).

Application architecture, on the other hand, is designed by an application developer and dictates the broad structure of the application. There are two pre-dominant application architecture styles -client-server and P2P.

From an application's perspective network architecture is fixed and provides a specific set of services to the applications.

18. What is Head of Line(HOL) blocking in HTTP. Explain how HTTP/2 avoids HOL blocking.
(3 marks)

Head of Line blocking (in HTTP/1.1) refers to the fact that each HTTP client has a limited number of TCP connections to a server (usually 6 connections per hostname) and a new request over one of those connections has to wait for the previous request on the same connection to complete before the client can make a new request.

HTTP/2 solves the HOL issue by multiplexing requests over the same TCP connection. So a client can make multiple requests to a server without having to wait for the previous ones to complete as the responses can arrive in any order.

19. What will be the output of the following code segment in JavaScript. **(3 marks)**

```
for(i=0;i<4;i++){  
    setTimeout(()=>console.log(i),0);  
}
```

4

4

4

4 With value of i set 0, the call stack is set to first setTimeout(). setTimeout() being a Web API is sent to the corresponding web API for processing. After 0 milliseconds the call back function will be sent to the call back queue. In the mean time the for loop continues with second setTimeout() function, which is then sent to the corresponding Web API. The event loop needs to wait for the call stack to be empty before it can push the call back functions onto the stack for execution. Since the call stack is not empty, the callback functions for the different setTimeout calls sit in the queue. The queue finally gets empty after the for loop ends and then the call-back function executes in order with the current value of i - which is 4.

20. List two advantages of a Resource based API over a RPC based API, giving suitable examples. **(4 marks)**

ANY 2

a) Semantics relies on HTTP verbs b) REST is more predictable than RPC as it relies on the shared semantic of HTTP verbs. c) Enables developing malleable software by breaking it down into components that are better isolated from each other's assumptions. d) Allows easy integration with other systems

21. Explain the difference between `defer` and `async` attributes of a `<script>` tag. (4 marks)

By including a script with `defer` tags, the script is downloaded asynchronously and in parallel with the HTML parsing, however, its execution is deferred until the whole HTML document has been parsed.

By including a script with the `async` attribute, the script is downloaded in parallel with the interpretation of the HTML. When the script is downloaded, it's executed, blocking the rendering until it finishes.

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.