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TRIMESTER II TERM TEST II – 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 (20) 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. The term "scaling out" refers to adding more servers to an application.
 - a. True
 - b. False



- 2. Requests in *Stateful* applications are self-contained, i.e. everything is contained within the request, while requests in *Stateless* applications are dependent on the server-side state.
 - a. True
 - b. False

False

- 3. When cache contents are set with a private directive, it means that the contents cannot be stored in browser's cache.
 - a. True
 - b. False



- 4. HTTP is a stateless protocol.
 - a. True
 - b. False



- 5. In quorum consensus, strong consistency arises when the read sets do not overlap with the write sets.
 - 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. To build web servers using the http module included in Node.js platform which function do we use?
 - a. get()
 - b. require()
 - C. createServer()
 - d. None of the above



- 7. Which of the following represents a record in NoSQL?
 - a. Field
 - b. Document
 - c. Collection
 - d. Database



- 8. Which of the following is not an advantage of a NoSQL?
 - a. Flexibility
 - b. Scalability
 - c. Availability
 - d. Cost-effectiveness



9. What will be the output of the following EJS code?

```
{
    "name":"<strong>Smith</strong>"
    Welcome, <%=name %>.
a. Smith
b. <strong>Smith</strong>
c. Smith
d. Run time error
b
```

- 10. Which of the following constrains is optional in REST architecture?
 - a. Layered system
 - b. Uniform interface
 - c. Stateless architecture
 - d. Code on demand



- 11. Which of the following security risks arises when restrictions on what authenticated users are allowed to do are not properly enforced?
 - a. Broken access control
 - b. Cryptographic failure
 - c. SQL injection
 - d. Session hijacking



- 12. Select **ALL** valid statements.
 - i. In causal consistency causally related writes must be seen by all devices in the same order.
 - ii. Asynchronous leader-follower replication models compromise availability in favour of consistency.
 - iii. A semi-synchronous leader-follower replication model avoids the issue of writes being lost when a leader fails.
 - iv. An overlap between read and write sets in a Quorum consensus based replication model allows reads to be consistent with the updated writes in the write set
 - a. ii Only
 - b. i Only
 - c. i, ii and iii Only
 - d. i, iii and iv Only



13. Consider an application that involves more writes than reads. In such a scenario, which of the following will be a suitable configuration for Quorum consensus replication such that there is a good balance between availability and consistency?



- 14. Which of the following response headers will tell the client that the response is to be cached for 1 minute?
 - a. expires:1 minute
 - b. cache-control:max-age=60
 - C. expires:1 January 2020
 - d. cache-expires:max-age=60

b

- 15. Which of the following is true of NoSQL databases?
 - i. They provide faster access to data than relational database management systems (RDBMS)
 - ii. They provide improved ability to keep data consistent
 - iii. They allow easy replication
 - iv. They support efficient storing of very large amounts of sparse data
 - a. i, iv Only
 - b. i, iii Only
 - c. i,ii and iii Only
 - d. i,iii and iv Only



SECTION C Short Answer Questions (20 marks)

Instructions: There are 5 questions in this section. Marks for questions in this section are included with the question.

16. What is a token-based authentication. Explain its use in the design of stateless applications. (4 marks)

Token based authentication allows user to enter their username and password in order to obtain a token which can be used to verify their identity without using their username and password. Once their token has been obtained, the user can offer the token - to prove their identity for a time period - to the remote site.

Token based authentication supports the design of stateless applications as they provide a way to verify users by having much of the session information stored on the client side. Stateless authentication uses tokens, most often a JSON Web Token (JWT), that contain user information. The server only has to match the token key and cryptographic signature to verify the token and then extract the identity of the user from the token thereby reducing the server overhead involved in accessing the database to verify the desired details. 17. What is Cross Site Request Forgery? Explain by giving a suitable example. (4 marks)

In a CSRF attcak, the victim is deceived to execute unwanted actions unknowingly on a web application in which they are currently authenticated. With a little help of social engineering (such as sending a link via email or chat), an attacker tricks the users of a web application into executing actions of the attacker's choosing.



18. Explain the difference between cache-aside and write-through caching strategy. List one advantge of write-through caching strategy over cache-aside strategy. (4 marks)

In cache-aside strategy, data is directly written to a data store. Data is loaded into the cache only when necessary. If application needs data for some key x, search is performed in the cache first. If data is present, it is returned, otherwise, it is retrieved from data source, put into the cache and then returned.

In write-through strategy, while inserting or updating data in the database, the data is inserted in the cache as well. So both of these operations should occur as a single transaction.

Advantage of write-through over cache-aside strategy: No stale data OR Less overhead as if there is a cache-miss there are three round trips involved in cache-aside - check in the cache, retrieve from database, pour the data into the cache. 19. Explain the use of Last-Modified and ETags as cache control headers. (4 marks)

Both Last-Modified and ETags can be used to determine if cached content is up to date. These are used by a client to make conditional requests for a resource from the remote server based on whether the requested resource has changed since the last time it was received by the client.

The Last-Modified response header specifies the last time a change was made in the returned content, in the form of a time stamp. When another request is made for the same content, the client sends the value from the Last-Modified header to the remote server in the If-Modified-Since request header.

ETag values are unique identifiers generated by the server and changed every time the object is modified. When another request is made for the same content, the client sends the value in the ETag header back to the remote server in the If-None-Match header.

20. List two differences between caching and replication.

(4 marks)

1.Cache is usually filled in based on demand and therefore involves pulling data from original server while replication systems tend to push data to maintain mirror copies of the same data at different places on the network.

2.Caching is majorly used for improving performance by maintaining a copy close to the client while replication is geared towards resilience and fault tolerance.

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.

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