TSR: Second Partial

This exam consists of 20 multiple choice questions. In every case only one answer is correct. You should answer in a separate sheet. If correctly answered, they contribute 0,5 points to the exam grade. If incorrectly answered, the contribution is negative: -0.167. So, think carefully your answers.

THEORY

1. **Service deployment requires the initial installation and configuration of a service application. Besides those tasks, deployment also includes other tasks like...**

A	Program debugging.
B	Service lifecycle management.
C	Program development.
D	Program design.

2. **The goal of dependency injection is...**

A	To resolve inter-component dependencies using configuration files.
B	To eliminate all inter-component dependencies at design time.
C	To keep dependency resolution as transparent as possible for the component developer.
D	To avoid the usage of containers, since they introduce performance overheads.

3. **Let us assume a stateful service that needs 400 ms to locally process each update request, updating a set of data that can be transmitted to other nodes in 20 ms and applied there in 30 ms. A request message may be broadcast (in total order) in that network in 3 ms. A read-only request may be locally served in 20 ms. The ratio of accesses is 80% reads and 20% writes.**
In order to scale out that service, the best approach is...

A	To replicate it following the active model.
B	To replicate it using the passive model, forwarding all requests to the primary replica.
C	To replicate it using the passive model, but allowing that backup replicas also reply to read-only requests.
D	To not replicate it at all, since replication introduces too much coordination and does not allow any efficient scaling.

4. In data-centred consistency models, we may say that model A is stronger than B in the following cases:

A	A: causal, B: cache.
B	A: FIFO, B: cache.
C	A: causal, B: sequential.
D	A: causal, B: FIFO.

5. Scalable NoSQL datastores do not support the relational model because...

A	The relational model does not admit replication.
B	The relational model cannot support sharding.
C	Relational data must be kept on disks.
D	Relational transactions may demand complex concurrency control mechanisms.

6. The CAP theorem...

A	...requires that scalable and available services use always a strict consistency model in order to tolerate network partitions.
B	...allows scalable services to relax their consistency while the network remains partitioned, ensuring in this way their availability.
C	...doesn't tolerate the implementation of highly available services using strong consistency models.
D	...doesn't make sense in cloud computing data-centres, since no network partition may happen in those systems.

7. Regarding service scalability...

A	A service cannot be scaled both horizontally and vertically.
B	Decentralised algorithms improve scalability on distance.
C	Sharding improves administrative scalability.
D	Contention avoidance is a key factor to achieve service scalability.

8. The main goals of a security subsystem are:

A	Protection, access control and physical security.
B	Protection, trust management and cryptographic support.
C	Accountability, integrity, confidentiality and availability.
D	Robust policies, efficient mechanisms and correct assurance.

SEMINARS

9. Which of the following tasks is NOT done when we use this docker command?

```
docker run –it ubuntu /bin/bash
```

A	Run the /bin/bash command in a container.
B	Download the "ubuntu:latest" image from the Docker Hub if it wasn't in the local docker repository.
C	Collect the output of the container being used for executing that command. That output can be shown using the `docker logs` command.
D	Remove automatically this container once its execution has terminated.

10. The `docker commit a b` command…

A	Creates a new container called "a" using the Dockerfile placed in folder "b".
B	Creates a new image "b" using the Dockerfile placed in folder "a".
C	Creates a new image "b" with the current contents of the container whose name or ID is "a".
D	Commits a docker transaction "a" that was started with a `docker pull` or `docker push` command, generating a container ID "b".

11. The "cluster" NodeJS module is used for…

A	…facilitating the deployment of a set of NodeJS programs onto a cluster of computers.
B	…managing multiple threads in a NodeJS process.
C	…managing a set of NodeJS processes able to share some resources; e.g., a listening port and a given program to be run by all of them.
D	…easily implementing multiple memory consistency models.

12. MongoDB uses the following mechanisms to improve its scalability:

A	Distributed concurrency control.
B	Decentralised algorithms.
C	Passive replication and data sharding.
D	Administrative scalability.

13. The main goal of MongoDB configuration servers is…:

A	To behave as arbiters when a replica fails.
B	To take care of data distribution in multiple shards.
C	To respect the CAP theorem when network partitions arise.
D	To detect node failures, starting a recovery protocol when any failure happens.

14. Regarding the thematic classification of vulnerabilities shown in Seminar 8, it is true that…

A	The exploitation of faults in security policies cannot be as easily automated as the exploitation of weak passwords.
B	Phishing is a “software error” vulnerability.
C	Physical protection is an example of “social engineering” vulnerability.
D	A fault in a personal-protection security policy demands less interaction to be exploited than a software-error vulnerability in the operating system.

15. Given this Dockerfile…

```
FROM zmq
RUN mkdir /zmq
COPY ./broker.js /zmq/broker.js
WORKDIR /zmq
EXPOSE 8000 8001
CMD node broker.js
```

Which of the following sentences is <u>FALSE</u>?

A	We need to have a “broker.js” file in the host directory where this Dockerfile is placed.
B	The program to be run in the containers started from this image uses port 8000 of the container, and it is mapped to port 8001 in the host computer.
C	By default, the containers generated from this Dockerfile will run the **node broker.js** command.
D	This Dockerfile assumes that a “zmq” docker image exists and that image holds a correct installation of the “node” JavaScript interpreter.

16. **Let us assume that the broker component shown in question 15 is now included in a docker-compose.yml file with these contents (among others that refer to other components):**

```
version: '2'
services:
...
 bro:
  image: broker
  build: ../broker/
```

Which of the following sentences is FALSE?

A	We may start at least one instance of the broker component with the command **docker-compose up –d**
B	Once the service is started, we may run 5 instances of the broker component using **docker-compose scale broker=5**
C	This "docker-compose.yml" file assumes that the Dockerfile shown in question 15 is placed in the folder "../broker/".
D	We may use **docker-compose stop bro** in order to stop all instances of this broker component.

17. **Let us assume a replication protocol based on a sequencer process that uses a PUB ZeroMQ socket to forward all write events to the participating processes, in order of reception. Those events are communicated to it using PUSH-PULL channels connected to a single PULL socket held by that sequencer. That replication protocol supports the following consistency models…**

A	Only the strict one.
B	Only the cache one.
C	Only the causal one.
D	Sequential, processor, causal, cache and FIFO.

18. **Given the following execution:**
W1(x)1, R4(x)1, W2(y)2, W1(y)3, W2(x)4, R3(y)2, W3(x)5, R1(x)5, R2(x)1, R3(x)1, R4(y)3, R1(y)2, R3(y)3, R4(x)5, R3(x)4, R2(y)3, R4(y)2, R1(x)4, R2(x)5, R4(x)4.
That execution respects the following consistency models…

A	Only the FIFO one.
B	Only the cache one.
C	Processor, FIFO and cache.
D	Sequential, processor, causal, cache and FIFO.

19. **Given the following file-downloading server program…**

```
var cluster = require('cluster');
var fs = require('fs');
var path = require('path');
var zmq = require('zmq');
var os = require('os');
const ipcName = 'Act2.ipc';
const dlName = 'ipc://'+ipcName;
if (cluster.isMaster) {
   var numCPUs = os.cpus().length;
   var rt = zmq.socket('router');
   var dl = zmq.socket('dealer');
   rt.bindSync('tcp://127.0.0.1:8000');
   dl.bindSync(dlName);
   rt.on('message', function() {
         msg = Array.apply(null, arguments);
         dl.send(msg);   });
   dl.on('message', function() {
         msg = Array.apply(null, arguments);
         rt.send(msg);   });
} else {
  var rep = zmq.socket('rep');
  rep.connect(dlName);
  rep.on('message', function(data) {
    var request = JSON.parse(data);
    fs.readFile(request.path, function(err,
data) {
     if (err) data = ' NOT FOUND';
      rep.send(JSON.stringify({
          pid: process.pid ,
          path: request.path ,
          data: data ,
          timestamp: new Date().toString()
      }))
   })
  })
}
```

We have tried to run that program, but it didn't do anything useful. Its main problem is that …

A	ZeroMQ sockets do not admit an "**ipc://**" transport.
B	No cluster worker process has been created.
C	We are trying to forward "cluster" internal messages through a ZeroMQ DEALER socket.
D	A server cannot use a ROUTER socket as its endpoint.

20. **The OpenSSL Heartbleed vulnerability described in Seminar 8 is an example of vulnerability that belongs to these classes:**

A	"Fault in security policy" regarding its category and "human staff" regarding its origin.
B	"Software error" regarding its category and "library/middleware" regarding its origin.
C	"Social engineering" regarding its category and "developer" regarding its origin.
D	"Software error" regarding its category and "human staff" regarding its origin.