TSR: Second Partial

This exam consists of 10 multiple choice questions. In every case only one answer is correct. You should answer in a separate sheet. If correctly answered, they contribute 1 point to the exam grade. If incorrectly answered, the contribution is negative: -0.33. So, think carefully your answers.

1. In order to adequately deploy a replicated service, we should ensure that…:

A	Its replicas are placed in different computers that do not depend on the same possible failure sources.
B	Its replicas are implemented in JavaScript.
C	Its replicas use ZeroMQ as their communication middleware.
D	The deployment is made with the Docker tools.

2. Regarding coupling in distributed services, we must ensure that its components show…

A	Weak coupling, since this means that all components are reliable.
B	Strong coupling, since this means that components use decentralised algorithms.
C	Strong coupling. This means that components are replicated by default.
D	Weak coupling, since this means that inter-component messages are small and inter-component synchronisation is very relaxed, if needed.

3. Which of the following cloud service models takes care of handling elasticity for the services deployed by its customers?

A	SaaS.
B	IaaS.
C	PaaS.
D	All of them.

4. Which of the following statements about security in a distributed system is FALSE?

A	Distributed systems are potentially vulnerable due to their need of inter-node communication.
B	Denial of service attacks consist in flooding the instances of a service with more requests than they may serve.
C	Distributed systems are potentially vulnerable because we cannot enforce physical access control mechanisms in all their sites and all their communication channels.
D	Distributed systems have an easily identifiable trusted computing base.

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5. **Let us consider the following execution in a system with three processes (P1, P2 and P3):**
W1(x)1, R2(x)1, W2(y)3, W1(y)2, R1(y)3, R3(y)2, R3(y)3, R3(x)1,…
…where P2 doesn't accept value 2 on "y" written by P1 in the fourth action of this trace.
The strongest memory consistency model that is respected by that execution is:

A	FIFO.
B	Sequential.
C	Cache.
D	Causal.

6. **Let us consider the following execution in a system with three processes (P1, P2 and P3):**
W1(x)1, R2(x)1, W2(y)3, R1(y)3, W1(y)2, R2(y)2, R3(x)1, R3(y)3, R3(y)2,…
The strongest memory consistency model that is respected by that execution is:

A	FIFO.
B	Sequential.
C	Cache.
D	Strict.

7. **The "mongod" component in MongoDB is a…:**

A	Proxy to be held by client processes in order to properly interact with the MongoDB configuration servers.
B	Workload balancer that forwards client requests to the appropriate "mongos" server. The latter locally manages an instance of the MongoDB database.
C	A JavaScript module that should be required by NodeJS programs in order to use a MongoDB database.
D	The server that locally manages an instance of the MongoDB database.

8. **Assuming that we are developers, in order to reduce any possible vulnerabilities of our built distributed services, which is the best of the following approaches?**

A	To periodically check that our development tools, the middleware and libraries being used and all deployment target hosts have received all their security updates.
B	To deploy our services using docker-compose.
C	To assign administrator privileges to every user of our service.
D	To rely on the security reputation of the operating system used in the host computers, demanding that all hosts use the best operating system in this regard.

9. Considering this program...

```
var cluster = require('cluster');
var http = require('http');
var numCPUs = require('os').cpus().length;
function processRequest(req,resp) {
  // Some code for processing an HTTP request and generate its response.
}
if (cluster.isMaster) {
  for (var i=0; i < numCPUs; i++) cluster.fork();
  cluster.on('exit', function(worker) {
    cluster.fork();
  });
} else {
  http.createServer(processRequest).listen(8000);
}
```

The following sentences are true:

A	If a worker process dies, the master generates another one.
B	This program creates as many worker processes as processor cores exist in the underlying machine.
C	Worker processes use the "processRequest" function in order to serve each incoming HTTP request.
D	All the above.

10. Let us assume that a NodeJS programmer has written a broker component that listens to multiple ports: 8000 (incoming messages from clients), 8001 (connection for updating the broker configuration) and 8002 (outgoing messages, forwarded to worker servers). When clients and workers are placed in other hosts, it is recommended to map its port 8000 to port 80 at its host and its port 8002 to port 82 at its host. The broker is implemented in NodeJS, its program is called Broker.js and that file is placed in the same folder as this Dockerfile:

```
FROM zmq-devel
COPY ./Broker.js /Broker.js
CMD node /Broker.js
```

After using the command "docker build –t myBroker ." in that folder, we have tried to run this broker, but it is unable to properly interact with some local clients and workers.
In order to fix that problem, we should:

A	Add this line to the Dockerfile: PORT 8000 8001 8002
B	Add the following lines to the Dockerfile: PORT 80:8000 82:8002 PORT 8001
C	Add the following line to the Dockerfile: EXPOSE 8000 8001 8002
D	Nothing is needed in the Dockerfile. That problem is related to the arguments or options that have been used in the "docker run myBroker" command.