MILWAUKEE SCHOOL OF ENGINEERING

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE DEPARTMENT

CS4230 – Distributed and Cloud Computing 2023

Midterm

8.5 x 11 Note Sheet both sides

Name: _____

For FULL credit, please show all your work.

1) Cloud Computing Concepts   _____

2) Virtualization   _____

3) Containers, Orchestration, and Deployment   _____

4) Distributed Storage Technology   _____

Total (100 Points)   _____

1) Cloud computing concepts (each question 5 points)

1a) Which resources are typically provided by an *Infrastructure as a Service* cloud computing delivery model?

A. Applications

B. Virtual machines

C. Virtual private networks

D. Middleware software stacks

1b) What is the role of *virtualization* in cloud computing?

A. It removes operating system inefficiencies.

B. It improves the performance of web applications.

C. It optimizes the utilization of computing resources.

D. It adds extra load to the underlying physical infrastructure and has no role in cloud computing.

1c) In cloud computing, which *term* is used to describe the nature of IT infrastructure and allows dynamic scaling depending on the demand for resources?

A. Elasticity

B. Clustering

C. Consolidation

D. Virtualization

1d) What *technology* is used to logically assign and separate physical resources such as memory and CPU in a cloud-computing model?

A. Bios

B. Hypervisor

C. Load balancer

D. Auto scaling

1e) Why can cloud providers experience lower variability in demand over time than individual users?

A. Economies of scale

B. Cost associativity

C. Statistical multiplexing

D. Fine-grained billing

2) Virtualization

2a) Hypervisor is often used to describe the interface provided by what cloud computing functional layer. *Select all that are true.*

A. Software as a Service (SaaS)

B. Platform as a Service (PaaS)

C. Application as a Service (AaaS)

D. Infrastructure as a service(IaaS)

2b) Hypervisor. *Select all statements that are true.*

A. Multiple instances of a variety of OS's may share the same server's virtualized hardware resources.

B. Presents to the guest operating systems a virtual operating platform, and monitors the execution of the guest operating systems.

C. Multiple instances of a variety of OS's may share the same server's virtualized hardware resources.

D. A Type 2 hypervisor runs directly on the host's hardware to control the hardware and to monitor guest operating systems.

2c) Containerization. *Select all that are true.*

A. Allows applications to be packaged with their dependencies and run in an isolated environment.

B. Emulate the hardware of a physical computer and allow multiple operating systems to run on a single physical host.

C. Allows applications to be packaged with their dependencies and run in an isolated environment.

D. Share the same kernel as the host operating system, but have their own file system, networking, and process space.

2d) Clearly and succinctly explain the concept of paravirtualization and how it is different than using a traditional hypervisor.

2e) How could you use virtualization to increase world wide compute resources?

3) Containers, Orchestration, and Deployment

3a) What are microservices?

3b) What are 3 key advantages, and 3 key disadvantages of microservice architectures?

3c) Clearly and succinctly differentiate between load balancing and autoscaling.

3d) Clearly and succinctly differentiate between Docker Compose and Kubernetes. In your explanation provide a suitable use case for each technology.

3e) You are tasked with redesigning Docker. What key feature would you add or change?

4. Large Distributed Key Value Storage Systems Part 1

4a) NoSQL – Key Value Data stores can be effective solutions for: (*select all that apply*).

A. Document indexing

B. Scalability

C. ACID

D. Flexible data model

4b) Consistent hashing is a strategy for dividing up keys/data between multiple machines. How does consistent hashing differ from traditional hashing techniques?

4c) Vector Clocks. Which event is concurrent with vector clock (2, 8, 4)

    A. (3, 9, 5)
    B. (3, 8, 4)
    C. (1, 7, 3)
    D. (4, 8, 2)

4d) Cap Theorem. Is it possible to have a distributed system with high availability while still providing strong consistency guarantees? Justify your answer

4e) Consistent hashing is a strategy for dividing up keys/data between multiple machines. How does consistent hashing differ from traditional hashing techniques?