

Internal Assessment Test 1 – April 2023

Sub:	Cloud Computing and Applications				Sub Code:	18CS643	Branch:	CSE
Date:	25.04.2023	Duration:	90 mins	Max Marks:	50	Sem / Sec:	6 A,B,C	

Answer any FIVE FULL Questions

MARKS

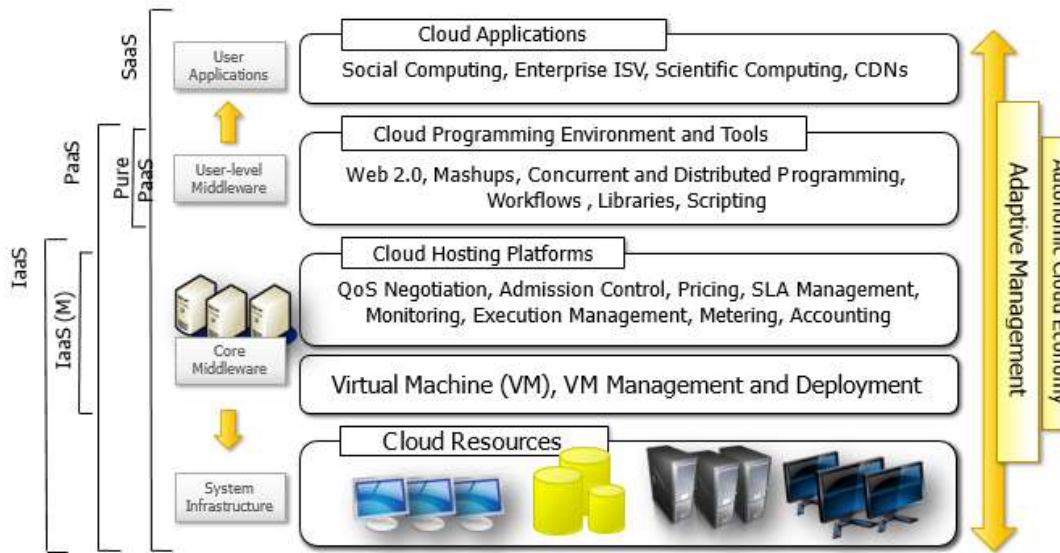
OBE

1 (a) With a neat diagram explain cloud computing reference model

8.5M

CO RBT

CO1 L2



IaaS

- Deliver **infrastructure on demand** in the form of virtual hardware, storage, and networking
- **Virtual hardware** is utilized to provide compute on-demand in the form of VM instances.
 - Created on user’s request on provider’s infrastructure.
 - Users are given tools and interfaces to configure the software stack installed
- in the VM.
 - Pricing Model : dollars per hour depending on the characteristics of the virtual hardware.
- **Virtual Storage Space** : raw disk space – for persistent storage.
 - object space – high level abstraction for storing entities rather than files.
- **Virtual Networking** – virtual services that manage the networking among virtual instances.

PaaS

- Deliver **scalable and elastic runtime environments** on demand and host the execution of applications.

- These services are supported by a **core middleware platform** that helps create the **abstract platform** where applications are deployed and executed.
- Service provider focus on **scalability and fault tolerance**.
- User's focus on **logic of application** by using **provider's API and libraries**.
- Increases **level of abstraction** but user is also working in a **controlled environment**.
- Software as a service : provides **application and services** on demand.
- **Common desktop applications** : office automation, photo editing, Customer Relationship Management(CRM) are replicated in provider's infrastructure.
- Made more **scalable and accessible** through a **browser** on demand.
- Interaction is **shared** among multiple users
- **SaaS** is what sustains the load based on popularity on social networking sites.

(b) Identify whether it is IaaS, PaaS or SaaS for the following type of services

- Azure SQL database - PaaS
- Amazon EC 2 instances - IaaS
- Google Docs - SaaS

1.5M

CO1 L3

2 (a) List the characteristics and benefits of cloud computing and explain.

8M

CO1 L2



Cost Benefit

- Increased **economical return** due to reduced maintenance and
- **operational costs**
 - Because IT assets are turned into **utility costs**
 - Paid for as long as needed
 - Not paid up-front
- Before cloud computing : organizations had to deal with **capital costs**
 - Costs that enable business activities of organizations.
 - These costs on assets have depreciable value
- Small businesses and startups do not need large investments to start up
- Can grow as the businesses grow.
- Maintenance costs are reduced because of the renting costs
 - CSP's bear the cost because of economies of scale.

Agility

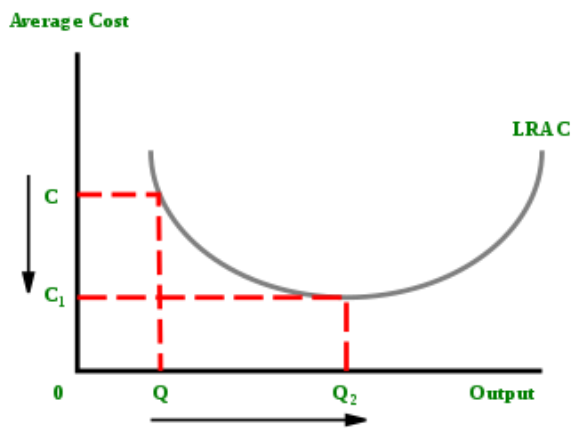
- Organizations are not constrained by capital costs for IT Assets.
- Reduced need for **capacity planning**
 - Workload Spikes which are unplanned – add more servers

- Remove them when workload returns to normal.
- **IaaS** provides easy mechanism to provision additional hardware and integrate it with existing systems.
- **PaaS** offers runtime models and programming models to scale applications
- **SaaS** offerings can be elastically sized on demand.

Benefit for end-users

- **End users:** Have and process data anytime, anywhere through **multiple devices**.
- Processing capabilities lies in the cloud so tasks that require considerable software investments previously is reduced
- **Providers: Multitenancy** allows for better utilization of shared infrastructure.
- Consolidation in large datacenters allow for optimization in resource allocation and energy efficiency.

(b)

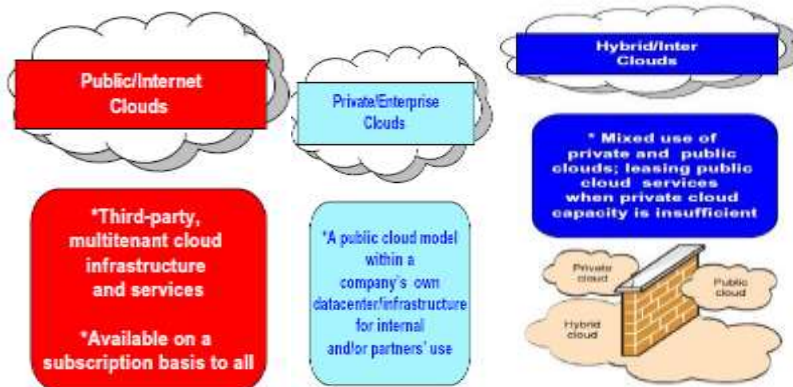


As quantity of production increases from Q to Q_2 , the average cost of each unit decreases from C to C_1 . LRAC is the long-run average cost.

What is this concept from micro-economics that is used to describe an advantage in cloud wherein maintenance costs are reduced because of the massive scale of operations in datacenters?

Economies of scale

3 (a) Classify and explain various types of cloud.



Public Cloud

- The cloud is open to the wider public.

2M

CO1 L3

7M

CO1 L2

- established by a third-party service provider
- Deployed using virtualized data centers.
- available to any consumer on a subscription basis.
- users' data and applications are deployed on cloud datacenters on the vendor's premises

Private Cloud

- The cloud is implemented within the private premises of an institution
- Generally made accessible to the members of the institution or a subset of them
- Large organizations that own massive computing infrastructures.
- Provides **more efficient use** of the computing facilities.
- Keeps confidential information **within an organization's premises**.
- governments and banks that have high security, privacy, and regulatory concerns prefer enterprise/private clouds.

Hybrid Cloud

- Combination of the two previous solutions
- If private cloud resources are unable to meet users' quality-of-service requirements,
- **hybrid computing systems** : public cloud resources and privately owned infrastructures.

Community Cloud

- The cloud is characterized by a multi-administrative domain involving different deployment models

(b) A company currently has application hosted in their on-premises data center. They want to expand their current capabilities by using services on the public cloud. Which of the following is the correct model type when it comes to this scenario and why?

- a) Private cloud
- b) Public cloud
- c) Hybrid cloud**

A company is planning on having their own private cloud infrastructure. Which of the following is are advantages of having a private cloud infrastructure in place?

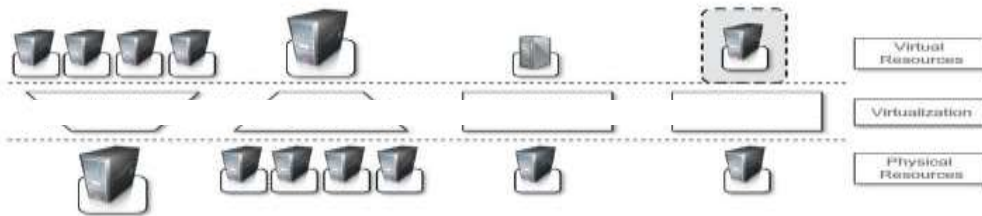
- a) Less cost and accountability
- b) Customer information protection**
- c) Less management and maintenance
- d) Meeting certain compliance standards**

4 (a)

3M

8M

CO1	L3
CO1	L2



Explain the various forms of Managed Execution in Virtualization with suitable examples.

- **Sharing** – allows separate computing environments within the same host
- **Aggregation** – when group of separate hosts are tied together to represent a single host.
- **Emulation** - when a different environment is presented to the user.
 - Allows for controlling and tuning the environment exposed to guests
 - Useful in testing purposes where a particular platform should be validated
 - Hardware support like file I/O or SCSI can be emulated
 - Old and legacy software can be run on emulated hardware
 - Eg. Arcade game emulator on PC.
- **Isolation** – allows guests to operate on a separate environment.
 - Guest interacts with the abstraction layer which provides access to the underlying layers.
 - It allows multiples hosts to run without interfering with one another
 - Provides a separation between a guest and a host.
 - VM can filter activity of guest.
- Another important characteristic : **performance Tuning**
 - Migration of VM's
 - Provide QoS stated in the SLA

(b) On a particular server

a. **You can reboot VM without it affecting other VMs**

b. If you reboot one VM, all other VMs reboot at the same time

c. If you want to reboot one VM, then server has to be first rebooted.

Which of the above statements is correct and what property of virtualization from part a does this relate to? **Isolation**

5 (a) Explain the virtualization model with a neat diagram.

- virtualization technologies provide a virtual environment for not only executing applications but also for storage, memory, and networking
- Supported by VM-based programming languages.
 - Java VM – applets
 - .NET Framework
 - Google – Java and Python

Increased performance and compute capacity

- Normal PC have enough resources to host a virtual machine manager.
- Supercomputers have immense compute power and can accommodate 100's or

2M

CO1

L3

[07]

CO 1

L2

1000's of VM's

Underutilized hardware and software resources

- Underutilization happens because of i) increased performance/computing capacity

ii) limited/sporadic use of resources.

- Many computers are only partially used during work hours.
- 24/7/365 basis : requires a transparent environment

Lack of space

- Server consolidation – brings several different applications under one server, improves hardware underutilization, reduces power consumption

Green initiatives

- Datacenter –requires energy to keep the servers on and also cooling them.
- Virtualization technology provides efficient means for server consolidation.

Rise of administrative costs

- Servers require administrators – h/w monitoring, replacing defective components, server setup, updates, resource monitoring, backups.
- Cooling and administrative costs are higher than the IT equipment
- Virtualization – reduces the number of servers, reduces cost of administrative personnel.

- 3 components: hardware virtualization
 - Guest, host, virtualization layer

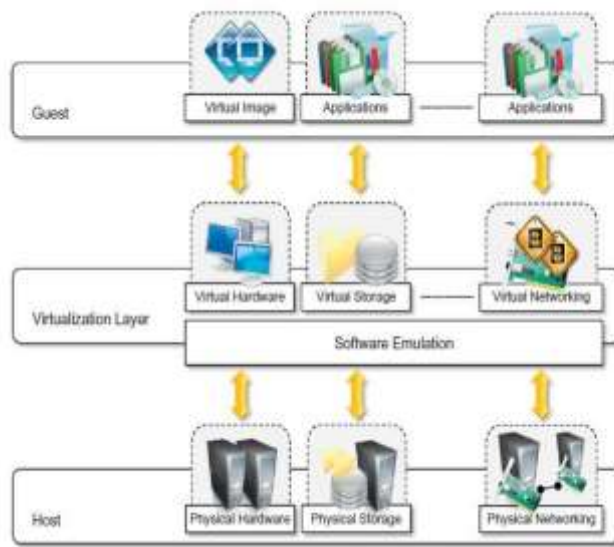
- Host : original environment where

- guest is managed.

- **Virtualization layer** : responsible for recreating the same or different environment.

- **Network Virtualization** : guest application and users interact with VPN(Virtual Private Network)

- Virtual environment is created by means of a software **program**.



(b) State the type of virtualizations – Hardware-Assisted Virtualization, Para-virtualization, Full Virtualization, Partial Virtualization, Programming language Level, OS Level

[03]

- i) JVM – Program Level
- ii) FreeBSD Jails – OS Level
- iii) Xen Hypervisor – Para Virtualization
- iv) Address space virtualization – Partial Virtualization
- v) Intel VT – Hardware Assisted
- vi) VMWare - Full virtualization
- vii) CLI - Programming language Level

CO1 L3

6 State the pros and cons of virtualization

4M

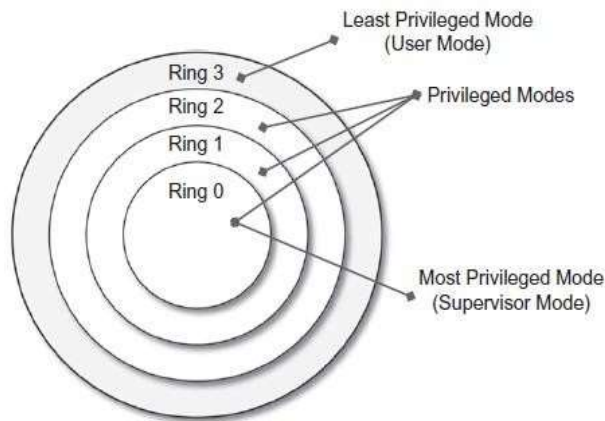
Pros:

- Managed Execution
- Portability
- Self-containment
- Efficient Usage of Resources

Cons:

- Performance degradation
- Inefficiency / degraded user experience
- Security holes and new threats

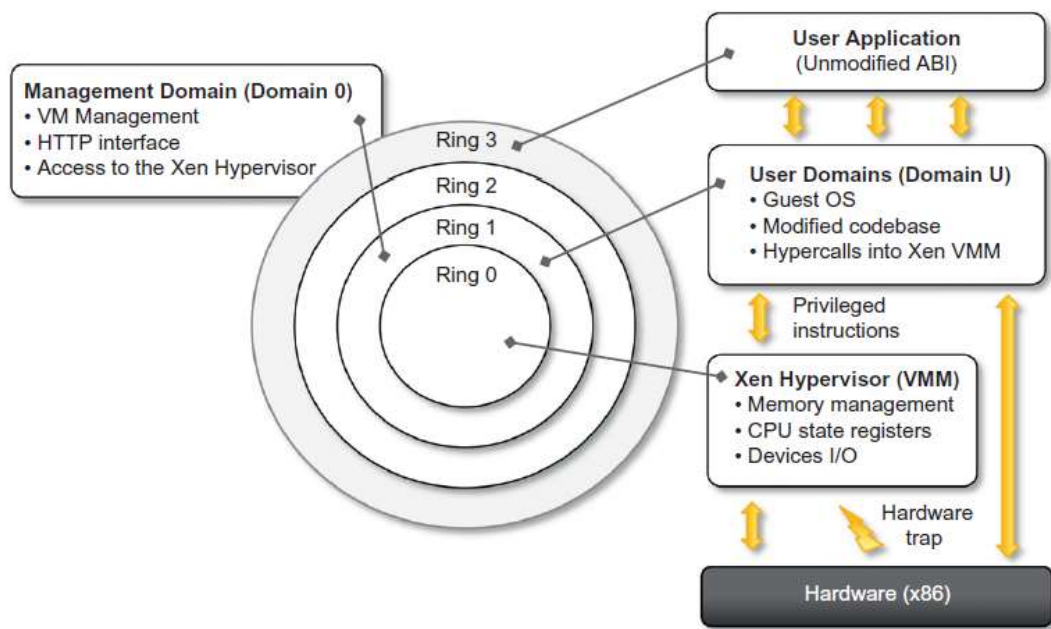
CO1 L2



By using Xen Paravirtualization model, explain the role of the various hierarchy of privileges and which portion runs on the various rings.

Xen hypervisor runs at Ring 0 (Supervisor Mode).

- Done by eliminating performance loss while executing instructions that require special management.
- Done by modifying portions of guest OS
- Not a transparent solution for implementing virtualization
- Guest OS are executed within domains that represent VM instances.
- Specific control software which has privileged access to host and controls other guest OS's is executed in a special Domain 0.
- It hosts an HTTP server that serves requests for VM creation, configuration and termination
- Uses hypercalls : the sensitive system calls exposed by the VM interface of Xen.
 - Executed directly would result in trap (silent faults) – prevents normal operations of operating system.
- Paravirtualization – required OS codebase to be modified.
 - Not all OS can be used in Xen environment
 - Legacy OS cannot be modified to run in Ring 1 as codebase is not accessible.
 - Open Source OS like Linux can be easily modified.
 - Some components of windows family is not supported unless hardware-assisted virtualization is available



--	--

Course Outcomes		Blooms Level	Modules covered	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PO 16
CO1	Explain cloud computing, virtualization and classification of services of cloud computing	L2	1,2	3	2	2	2	0	3	3	0	0	0	0	0	3	0	2	2
CO2	Illustrate architecture and programming examples in cloud	L3	2,3,4	3	2	0	2	2	3	3	0	0	0	0	0	3	2	0	2
CO3	Describe the platforms for development of cloud applications with examples	L2	4,5	3	3	3	3	2	3	3	0	0	0	0	0	3	2	0	2

CO PO Mapping

COGNITIVE LEVEL	REVISED BLOOMS TAXONOMY KEYWORDS
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.

L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.
----	---

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)				CORRELATION LEVELS	
PO1	Engineering knowledge	PO7	Environment and sustainability	0	No Correlation
PO2	Problem analysis	PO8	Ethics	1	Slight/Low
PO3	Design/development of solutions	PO9	Individual and team work	2	Moderate/ Medium
PO4	Conduct investigations of complex problems	PO10	Communication	3	Substantial/ High
PO5	Modern tool usage	PO11	Project management and finance		
PO6	The Engineer and society	PO12	Life-long learning		
PSO1	Develop applications using different stacks of web and programming technologies				
PSO2	Design and develop secure, parallel, distributed, networked, and digital systems				
PSO3	Apply software engineering methods to design, develop, test and manage software systems.				
PSO4	Develop intelligent applications for business and industry				
