BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI (RAJ.)
I SEMESTER 2023-2024
Mid Semester Test- PART B (OPEN BOOK)

Course No.: CS/SS G527 **Course Title:** Cloud Computing
Date: 14th Octo (11:00-12:30) **Maximum Marks:** 17% (34M)

Note:

- Overwritten answers will not be accepted for rechecks
- Write all parts of a question together.

Q1. For each of the following statements, argue whether it is correct or not

(a) Hadoop Mapreduce is not a good choice for database implementations.
(b) Kafka is scalable to any speed of a stream.
(c) No program can be fully binary translated before it is executed.
(d) When a source program is binary translated and executed on a target with different ISA, there is no need of keeping track on source program counter.
(e) Hardware assisted virtualization doesn't need shadow page tables

[10M]

Q2. In the context of memory virtualization, the following are the virtual-to-real, real-to-physical and virtual-to-physical page tables. Identify and fix anomalies if any. Give explanation. Also identify which pages will cause real and hidden page faults.

v	Virtual	Real
0	1000	-
1	2000	7000
1	3000	9000
0	4000	-

v	Virtual	Physical
0	1000	-
0	2000	-
1	3000	19000
1	4000	20000

v	Real	Physical
0	5000	-
0	7000	-
1	9000	19000

[4M]

Q3. Answer the following briefly

(a) Why VMware ESX server scans the guest OS instructions but not the instructions of the applications running in guest OS though both can have critical instructions?
(b) Explain how can Zookeeper be used to elect a new leader in a cluster. Use Zookepeer API.
(c) Explain with example what problems can be there without ballooning technique?

[3M]

Q4. Consider the following overheads.

Event	Overhead (in terms of CPU cycles)

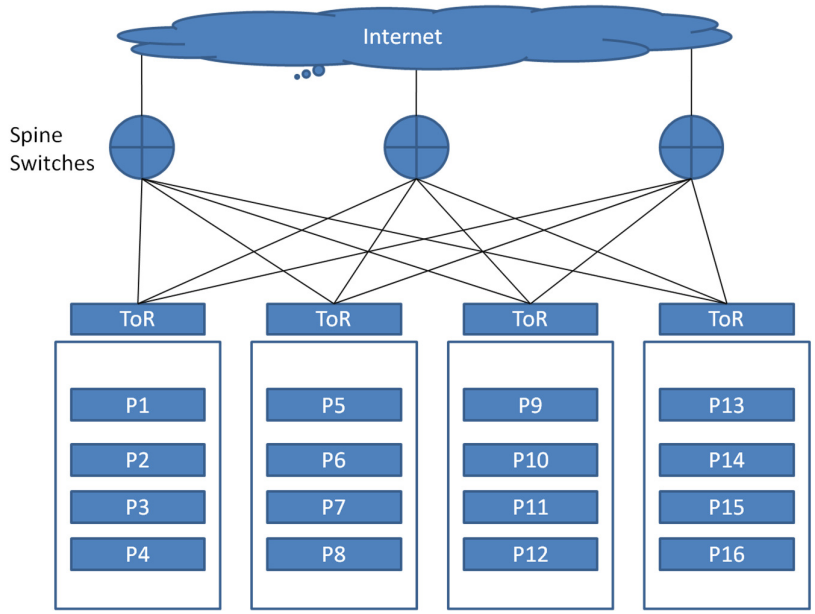
Interrupt	x
Page fault	y
Context Switching	z

For each of the following, compute overhead for both, compare both and state which is lower. Assume any other relevant parameters and justify. Show all steps.

(a) System call in Container Vs System call in VMware ESX Hypervisor
(b) System call in Xen Vs Faster system call in Xen
(c) Page table update in VMware with Software Virtualization Vs Page table update in Xen
(d) Page table update in VMware with Software Virtualization Vs Page table update in VMware with Hardware-assisted Virtualization

[8M]

Q5. Consider the design of a data center (given in the figure below) over which a cloud system resides. Assume that each link has 1Gbps bandwidth and 95% availability. Each physical machine (PM) (named as P1 ... P16) has 16 cores, 32GB RAM and 1Gbps NIC connected to ToR switch. All switches have the availability of 92%. Links inside the rack have the availability of 100%. Availability of PM is 92%. Availability of VM is 92%.



a) A tenant company named SmartCart is hosting an eCommerce service on the cloud in VM2 on P3. Cloud provider has signed SLA for hosting this service mandating 99.9% availability of the service. Examine whether the given cloud infrastructure can support the SLA for this service. Show all calculations.

b) A cluster is made up of P1...P4 each machine having 16 cores, and a service is deployed on these machines. If each pages takes 10 ms to process a page, how many concurrent users can it support if think time is 2 minutes.

[9M]

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