National University of Computer and Emerging Sciences, Lahore Campus

Course:	Introduction to Cloud Computing	Course Code:	CS-499
Program:	BS (Computer Science)	Semester:	Spring 2018
Duration:	60 Minutes	Total Marks:	30
Paper Date:	13-Apr-18	Weight	15%
Section:	A and B	Page(s):	6
Exam:	Midterm	Reg. No.	

Instruction/Notes:

- No answer sheet will be given. Questions must be answered in the space provided
- Use of simple scientific calculators is allowed
- All the questions are compulsory
- Read the questions carefully before answering them
- If you are certain that something is unclear, make a *reasonable assumption*, mention it and answer the question
- Overwritten answers in MCQs and True/False questions will not get any credit, so think before you circle a choice
- MCQs and True / False questions carry 1 mark each
- No rough sheets will be given

Section	Maximum Marks	Marks awarded
A	10	
B	10	
C	10	
	Total	

Section A (10 marks) - TRUE / FALSE Questions. (Circle the best answer)

1. In the context of content delivery networks, the center placement problem is computationally complex

   TRUE / FALSE

2. The remote administration system (RAS) is also known as virtualization infrastructure manager (VIM)

   TRUE / FALSE

3. The self service portal is responsible for allocating IT resources by interacting with the hypervisors

   TRUE / FALSE

4. A cloud customer can create their own portal using remote administration system APIs provided by a cloud service provider

   TRUE / FALSE

5. A resource sends messages to a polling agent automatically in response to a usage event

   TRUE / FALSE

6. The resource replication mechanism is essential for a failover system to work

   TRUE / FALSE

7. A state management database will always completely eliminate the per-application state data stored in the applications memory

   TRUE / FALSE

8. A content delivery network protects the origin server from DDoS attacks

   TRUE / FALSE

9. Internet Cache Protocol (ICP) messages are transmitted over TCP

   TRUE / FALSE

10. Topology informed replica placement schemes in a content delivery network prefer placement of surrogate servers in networks with higher outdegree

    TRUE / FALSE

Section B (10 marks) - Multiple Choice Questions (Circle the best answer)

1. The cloud billing management system is composed of which of the following?
    a. Pay-per-use monitor
    b. Polling agent
    c. Pricing and contract manager
    d. Both a and c
2. A cloud customer wants to re-configure a running VM and then request creation of a new VM. Which of the following best describes the portal(s) that the customer must interact with?
    a. Usage and administration portal
    b. Self service portal
    c. Both of the above
    d. None of the above
3. Amazon S3 is an example of which of the following storage access level?
    a. Block storage
    b. Object storage
    c. Database storage
    d. File storage
4. Which of the following best describes the resource replication configuration in which only one IT resource serves requests at any given time?
    a. Active-active
    b. Active-passive
    c. Passive-active
    d. Passive-passive
5. Which of the following best describes the role of a multi-device broker?
    a. Allow multiple servers to cooperate as part of a server cluster
    b. Allow multiple storage devices to appear as a single large volume
    c. Allow multiple disparate devices to use a single cloud resource
    d. Break more than one devices simultaneously
6. Which of the following best describes the benefit(s) of a content delivery network?
    a. Reduce customer latency
    b. Protect content provider from DDoS attacks
    c. Reduce load on the origin server
    d. All of the above

7. Which of the following is an adaptive request routing scheme for content delivery networks?
    a. Round robin
    b. Random
    c. Server load
    d. None of the above
8. Which of the following is the pioneer in the field of content delivery networks
    a. Limelight
    b. Mirror Image
    c. Akamai
    d. Google
9. Server scaling up or scaling out does not impact which of the following?
    a. Network latency
    b. Network congestion
    c. Both of the above
    d. None of the above
10. According to the technical report on content delivery networks, the cache servers reside in which layer of the architecture?
    a. End-user
    b. CDN
    c. Communication and connectivity
    d. Basic fabric

Section C

Q. 1: A content delivery network is considering two ISPs for deployment of surrogate servers at two sites. It is estimated that only one server on each site is sufficient. ISP A will charge a $2 / month server rental alongwith $1 / GB for network traffic for each site. ISP B will charge $4 / month server rental for each site alongwith $0.5 / GB for network traffic at site 1 and $0.1 / GB for site 2. Sites 1 and 2 are expected to have 10 GB and 5 GB of traffic, respectively, every month. Assuming that the content delivery network wants to have a single ISP scenario, which one is more economical, ISP A or B? You must show the actual monthly costs for each option to get any credit. [5 marks]

Q. 2: Consider a hypothetical content delivery network (CDN) consisting of four surrogate server sites namely A, B, C and D. Imagine a content provider who has signed up for this CDN's services to offload customer traffic. Suppose that after signing up, all client requests are equally distributed among the surrogate server sites (no client request goes directly to the origin server). The cache miss ratio at the surrogate sites is 30%, 20%, 10% and 5%, respectively.

(a) For this part, consider only the clients that are redirected to surrogate site A. For these clients, an HTTP request packet takes 50 ms, on average, to reach the surrogate site A. In case of a cache miss, the HTTP request will need to be forwarded to the origin server. It takes another 100 ms for the average HTTP request packet to get from the surrogate site A to the origin server. What is the overall average path delay for a client HTTP request? [3 marks]

(b) What fraction of traffic is offloaded from the origin server? [2 marks]