**Northeastern University – Silicon Valley**

CS 6620 Cloud Computing

**Homework Set #2** [100 points]

***INSTRUCTIONS: Please provide clear explanations in your own sentences, directly answering the question, demonstrating your understanding of the question and its solution, in depth, with sufficient detail. Submit your solutions [PDF preferred]. Include your full name. Do not email the solutions.***

**PART I: Concepts and Theory, Algorithms [60 points]**

Answer the below questions in your own words (1 – 2 small paras each; Diagrams as needed).

Please provide accurate, concise (maximum 10 sentence) answers. **All questions carry 4 points.**

1. Explain, in your own words, what Systems Virtualization is, and 4 advantages of it giving a scenario example for each.  (use specific, concrete scenario to illustrate the benefit.)
2. Why is virtualizing the X86 processor necessary for systems  Virtualization?
3. What are user mode instructions and kernel mode (privileged) instructions?  Give 2 examples for each.
4. What are the challenges involved in virtualizing the X86 processor? How does Virtualization address them?
5. How is virtual memory implemented in a real machine?  Explain how it would be implemented in a VM?  Why is it very costly?

For the below questions, first consider a public cloud (IaaS) platform like AWS, where multple tenants can rent infrastructure and build their own IT environments. Then, explain what the below technologies (aka ~ features) are and why you need them to build the above public cloud (what functions does the feature serve?) Please provide 2 use cases in each case which need the particular feature. Provide detailed answers (2- 3 para What, How, Why) with a diagram in every case. **All questions carry 8 points**.

1. VPC
2. VPN
3. VLAN
4. DHCP
5. NAT

**PART II: LAB (You can use AWS Cloud or any other available tools) [40 points]**

1. Create a Docker Container following this tutorial

<https://docker-curriculum.com/>

1. What are the differences between a VM and a Container?
2. Your startup Stitchfix.com uses a 3 tier App architecture. You need to scale the platform up (lot of business demand from users.) In this context, what do the below functions mean? (please explain)
3. automating deployment,
4. scaling,
5. management of containerized applications
6. What is Kubernetes? Why dod you need it to run the above startup platform?