


National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Internet of Things (IoT)	Course Code:	CN503
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	Duration:	90 Minutes	Total Marks:	20
	Paper Date:	30/10/2018	Weight	20
	Section:	ALL	Page(s):	6
	Exam Type:	Mid Term		

Student : Name: _____ **Roll No.** _____

Instruction/Notes: Attempt questions on this paper. You may use rough sheet but it should not be attached to this paper as it will not be marked.

Question 1: Choose the best option for the following MCQs and provide your answer in the below table. Answers outside the table **will not** be considered. [5 Marks]

MCQ #	Answer
1.1	
1.2	
1.3	
1.4	
1.5	

1. An IoT gateway generally provides the connection between _____ and _____

- a) Cloud and IoT controller
- b) Local area network and Cloud
- c) Local area network and IoT controller
- d) IoT controller and IoT node

1.2. Which bluetooth version enables low energy?

- a) Bluetooth 3.0
- b) Bluetooth Smart Ready
- c) Bluetooth 2.0/Bluetooth Smart
- d) Bluetooth 1.0/Native Bluetooth

1.3 A huge number of devices connected to the Internet of Things have to communicate automatically, not via humans. What is this alternate name for this paradigm?

- a) Skynet
- b) Bot 2 Bot
- c) Machine 2 Machine
- d) Intercloud

1.4 **Spimes** in the context of Internet of Things are devices/objects/entities that can be defined according to _____ and _____.

- a. Space and time
- b. Attributes and functions
- c. Cloud and Fog nodes
- d. Bigdata and analytic functions

1.5 The **Internet Ø** research initiative introduced prior to wider adoption of IoT-ware, discussed communication architectures for:

- a. Node to IoT gateway communication protocols
- b. General machine to machine communication
- c. New Internet architecture to support semantic web
- d. Elimination of routing protocols

For the following question, write/draw neat and clean answers. No credit will be given for an incomplete or in-cohesive answer. If you make any assumptions, state them clearly.

Question 2:

Scenario Overview

You have been given the task of designing an IoT environment (for a marble factory) comprising of two domains, each having twenty nodes. All domain 1 nodes are temperature monitoring sensors. While all domain 2 nodes serve as both temperature and humidity monitoring devices (dual role). The two domains are geographically separated by a distance of 2 Kms. The objective of having IoT nodes in either domains is to (1) monitor real-time sensory information i.e. temperature and (or) humidity as well as (2) utilize historical sensory information to predict future measurements to improve business policies.

Domain 1: A factory floor (~200 sq. meter) with a multitude of equipment, assembly robots and communication devices, that may result in high interference during wireless communication. Maximum feasible distance between any two nodes cannot be more than 3m.

Domain 2: A marble excavation mine containing people (miners), drilling devices and lighting equipment. Communication interference is relatively low, with maximum allowed distance between IoT nodes to be around 10m. However, node-to-node communication is needed to reach the gateway node placed at the entry point of the mine.

With the above general topology and considerations, answer the following questions:

2.1 From the three different types of general IoT architectures studied during lectures, which particular architecture would be most suitable to address the key requirements of the above scenario. Briefly explain your reasoning. [1 Mark]

2.2 Can the IoT nodes in either domain use the same addressing scheme? What additional technologies/frameworks (if any) will be needed if IoT nodes are assigned: [4 Marks]

(1) Public IPv4 addresses?

(2) IPv6 global unicast addresses?

(3) Private IPv4 addresses?

(4) Combination of IPv4 and IPv6 addresses?

2.3 Based on the operational considerations, what data-link (or MAC) layer technology/stack would be most appropriate for each of the following. Briefly justify your answer? [2 Marks]

(1) Domain 1

(2) Domain 2

2.4 Create a general topology for Domain 1 now, indicating: all the attributes that you have selected from 2.2 and 2.3. Draw additional components including nodes, addressing scheme being used as needed and caption accordingly. The resulting topology should be a working system/domain in all respects. [3 Marks]

2.5 Repeat the same for Domain 2.

[3 Marks]

2.6 Based on the topology that you have drawn for domain 1 and domain 2, what would be the routing protocol of choice (if needed)? Briefly explain reasoning for your answer.

[1 Mark]

2.7 Define the functionality of a fog/edge node and briefly describe if a fog node is necessary/helpful in the above scenario/domains?

[1 Mark]