DEPT:	CSE, IT and allied branches				
SEMESTER:	VI				
SUBEJCT CODE:	PCCCS602				
SUBEJCT NAME:	CLOUD COMPUTING & IOT				

Module No.	Textbook Name, Author, Publisher with edition	Section No. (if any)	Chapter No	Exercise Nos.	Page No. *(from – to)*
1 (Cloud Computing Fundamentals , Resource Management and Load Balancing)	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.		1	Not mentioned in the Book	41
	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.		2	Not mentioned in the Book	77
	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.		3	Not mentioned in the Book	108
	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.		4	Not mentioned in the Book	134

2 (Cloud Services)	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.		9	Not mentioned in the Book	325-326
3 (Cloud Security)	Study Materials				
4 (Introduction to IoT)	Introduction to IoT by Sudip Mishra, Cambridge University Press.		4	Not mentioned in the Book	95-96
	Introduction to IoT by Sudip Mishra, Cambridge University Press.		5	Not mentioned in the Book	113
5 (Protocols for IoT)	Introduction to IoT by Sudip Mishra, Cambridge University Press.		6	Not mentioned in the Book	126-127

	Introduction to IoT by Sudip Mishra, Cambridge University Press.		7	Not mentioned in the Book	158-161
	Introduction to IoT by Sudip Mishra, Cambridge University Press.		8	Not mentioned in the Book	209-211
	Introduction to IoT by Sudip Mishra, Cambridge University Press.		12	Not mentioned in the Book	281

Module 1

Cloud Computing Fundamentals, Resource Management and Load Balancing

Book: Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013

Chapter 1:

Review Questions

1. What is the innovative characteristic of Cloud computing?
2. Which are the technologies that Cloud computing relies on?
3. Provide a brief characterization of a distributed system.
4. Define Cloud computing and identify its core features.
5. What are the major distributed computing technologies that led to Cloud computing?
6. What is virtualization?
7. What is the major revolution introduced by Web 2.0?
8. Give some examples of Web 2.0 applications.
9. Describe the main characteristics of service orientation.
10. What is utility computing?

[Questions 1–10: 2 Marks]

11. Describe the vision introduced by Cloud computing.
12. Briefly summarize the Cloud computing reference model.
13. What is the major advantage of Cloud computing?
14. Briefly summarize the challenges still open in Cloud computing.
15. How does Cloud development differentiate from traditional software development?

[Questions 11–15: 5 Marks]

Chapter 2:

Review Questions

1. What is the difference between parallel and distributed computing?
2. Identify the reasons why parallel processing constitutes an interesting option for computing.
3. What is a SIMD architecture?
4. List the major categories of parallel computing systems.
5. Describe the different levels of parallelism that can be obtained in a computing system.
6. What is a distributed system? What are the components characterizing it?
7. What is an architectural style and what is its role in the context of a distributed system?
8. List the most important software architectural styles.
9. What are the fundamental system architectural styles?
10. What is the most relevant abstraction for inter-process communication in a distributed system?

2 Marks

11. Discuss the most important model for message-based communication.
12. Discuss RPC and how it enables inter-process communication.
13. What is the difference between distributed objects and RPC?
14. What are object activation and lifetime? How do they affect the consistency of state within a distributed system?
15. What are the most relevant technologies for distributed objects programming?
16. Discuss CORBA.
17. What is service-oriented computing?
18. What is market-oriented Cloud computing?
19. What is SOA?
20. Discuss the most relevant technologies supporting service computing.

5 Marks

Chapter 3:

Review Questions

1. What is virtualization and what are its benefits?
2. What are characteristics of virtualized environments?
3. Discuss classification or taxonomy of virtualization at different levels.
4. Discuss machine reference model of execution virtualization.
5. What are hardware virtualization techniques?
6. List and discuss different types of virtualization.
7. What are benefits of virtualization in the context of Cloud computing?
8. What are disadvantages or cons of virtualization?

2 Marks

9. What is Xen? Discuss its elements of virtualization.
10. Discuss the reference model of full virtualization.
11. Discuss the architecture of Hyper-V and discuss its use in Cloud computing.

10 marks

Chapter 4:

Review Questions

1. What does the acronym XaaS stand for?
2. What are the fundamental components introduced in the Cloud Reference Model?
3. What does Infrastructure-as-a-Service refer to?
4. Which are the basic components of an IaaS-based solution for Cloud computing?
5. Provide some examples of IaaS implementations.
6. What are the main characteristics of a Platform-as-a-Service solution?
7. Describe the different categories of options available in PaaS market.
8. What does the acronym SaaS mean? How does it relate to Cloud computing?
9. Give the name of some popular Software-as-a-Service solutions?
10. Classify the different types of Clouds.
11. Give an example of Public Cloud.
12. Which is the most common scenario for a Private Cloud?
13. What kind of needs is addressed by Heterogeneous Clouds?
14. Describe the fundamental features of the economic and business model behind Cloud computing.
15. How does Cloud computing help to reduce the time to market applications and to cut down capital expenses?
16. List some of the challenges in Cloud computing.

2 Marks

5 Marks

2 Marks

10 Marks

Module 2

Cloud Services

Book: Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013

Chapter 9:

Review Questions

1. What is AWS? What types of services does it provide?
2. Describe Amazon EC2 and its basic features.
3. What is a bucket? What type of storage does it provide?
5. What type of problems addresses Amazon Virtual Private Cloud?
6. Introduce and present the services provided by AWS to support connectivity among applications.
7. What is the Amazon CloudWatch?
8. What type of service is AppEngine?
9. Describe the core components of AppEngine.

2 Marks

10. What are the development technologies currently supported by AppEngine?

11. What is DataStore? What type of data can be stored in it?

12. Discuss the compute services offered by AppEngine.

13. What is Windows Azure?

14. Describe the architecture of Windows Azure.

16. What is AppFabric and which services does it provide?

17. Discuss the storage services provided by Windows Azure.

20. What is Windows Azure Platform Appliance? For which kind of scenarios it has been designed?

2 Marks

5 Marks

10 marks

Module-3
Cloud Security
Study Materials

1. What are the security challenges in cloud computing?
2. Define security governance.
3. Illustrate password assurance testing.
4. Which three basic cloud security enforcements are expected?
5. Analyze the different security threats in implementing SAAS.
6. Examine whether the virtualization enhances cloud security.
7. Differentiate the Physical and Cyber Security Protection at Cloud/Data Centers.
8. "Virtual machine is secured". Is it true? Justify your answer.
9. Generalize about the IAM.
10. Name the different Security Standards.

2 Marks

11. Discuss in detail about Software-as-a-Service Security.
12. i) Express in detail about the need of IAM. ii) Give the challenges in IAM.
13. Show what is Cloud Security Defense Strategies with neat diagram.
14. i.Explain in detail about security monitoring and incident ii.Define Application security and its use.
15. What is the purpose of IAM? Describe its functional architecture with an illustration.

5 Marks

16. Explain the Secure Software Development Life Cycle with neat diagram.
17. i) Compose in detail about the aspects of data security. ii) Generalize on data security mitigation.
18. Explain the security architecture design of a cloud environment and relate how it can be made possible to include such measures in a typical banking scenario.
19. Evaluate the security governance and virtual machine security.

10 Marks

20. For an SaaS application, who will be responsible to provide security for the infrastructure? Will it be cloud service provider or the cloud service consumer? Who will be responsible to ensure compliance with a privacy standard? Formulate your views about it .
21. Describe the benefits of different cloud Security standards. (SAML OAuth, OpenID, SSL/TLS).

Module-4
Introduction to IoT
Book: Introduction to IoT by Sudip Mishra, Cambridge University Press.

Chapter 4:

Exercises

(i) What is IoT?

(ii) What is smart dust?

(iii) Differentiate between IoT and M2M.

(iv) Differentiate between IoT and WoT.

2 Marks

(v) What is Web of Things (WoT)?

(vi) What are the various IoT connectivity terminologies?

(vii) Differentiate between an IoT proxy and an IoT gateway.

(viii) What is gateway prefix allotment?

(ix) How are locally unique (LU) addresses different from globally unique (GU) addresses?

(x) How is mobility handled in IoT networks?

(xi) What is the function of a remote anchor point in IoT networks?

(xii) What is tunneling?

(xiii) What is multihoming in IoT networks?

2 Marks

Chapter 5:

Exercises

(i)   Differentiate between sensors and actuators.

(ii)   Differentiate between sensors and transducers.

(iii) How is sensor resolution different from its accuracy?

(iv)   Differentiate between scalar and vector sensors.

(v)   Differentiate between analog and digital sensors.

(vi)   What is a an offset error?

(vii) What is a hysteresis error?

(viii) What is a quantization error?

(ix)   What is aliasing error?

5 Marks

(x)   Differentiate between hydraulic and pneumatic actuators with examples.

(xi)   What are shape memory alloys (SMA)?

(xii) What are soft actuators?

(xiii) What are the main features of shape memory polymers?

(xiv) What are light activated polymers?

10 Marks

Module-5

Protocols for IoT

Book: Introduction to IoT by Sudip Mishra, Cambridge University Press.

Chapter 6:

Exercises

(i)   What are the different data formats found in IoT network traffic streams?

(ii) Depending on the urgency of data processing, how are IoT data classified?

(iii) Highlight the pros and cons of on-site and off-site processing.

(iv) Differentiate between structured and unstructured data.

(v)   How is collaborative processing different from remote processing?

(vi) What are the critical factors to be considered during the design of IoT devices?

(vii) What are the typical data offload locations available in the context of IoT?

(viii) What are the various decision making approaches chosen for offloading data in IoT?

5 Marks

IoT Processing Topologies and Types   127

(ix) What factors are to be considered while deciding on the data offload location?

2 Marks

Chapter 7:

Exercises

(i) What is a piconet? — 2 Marks

(ii) What is a scatternet? Explain the working of a scatternet with a brief description of its various members. 5 Marks

(iii) Describe the protocol stack of Bluetooth.

(iv) What is BLE? 2 Marks

(v) Differentiate between class 1, 2, and 3 Bluetooth devices.

(vi) What are the various modes of operation of Bluetooth? 10 Marks

(vii) Describe the L2CAP layer in Bluetooth.

(viii) Describe the RFCOMM layer in Bluetooth.

(ix) What is service discovery protocol (SDP) in Bluetooth?

(x) Describe the Bluetooth baseband.

(xi) How does Bluetooth avoid collisions between simultaneously transmitting nodes?

2 Marks

(xii) Explain the protocol stack of Zigbee.

5 Marks

(xiii) What is ZDO? How is it different from APS?

(xiv) Elaborate on the various network topologies of Zigbee.

(xv) What are the various Zigbee device types?

(xvi) Describe the Zigbee network layer.

5 Marks

(xvii) What is AODV? Explain with an example.

(xviii) How is Zigbee different from Bluetooth?

(xix) How is Zigbee different from 6LoWPAN?

(xx) Explain the protocol stack of IEEE 802.15.4

(xxi) How is LWPAN different from PANs?

5 Marks

(xxii) Explain the terms:

    (a) DSSS

    (b) BPSK

    (c) QPSK

    (d) O-QPSK

(xxiii) Differentiate between CSMA/CA and CSMA/CD.

(xxiv) Differentiate between star and mesh network topologies.

(xxv) What are the various IEEE 802.15.4 network types?

(xxvi) Differentiate between RFD and FFD.

(xxvii) Differentiate between a PAN coordinator, router, and a device in IEEE 802.15.4.

5 Marks

(xxviii) What are the various IEEE 802.15.4 frame types?

(xxix) What is beaconing?

(xxx) How are beacon-enabled networks different from non-Beacon enabled networks?

2 Marks

(xxxi) What is HART? How is it different from wirelessHART?

(xxxii) Describe the protocol stack of HART.

(xxxiii) Describe the HART physical layer.

(xxxiv) Describe the HART data link layer.

10 Marks

(xxxv) Describe the HART network and transport layers.

(xxxvi) What is TDMA? Describe with an example.

(xxxvii) What is channel blacklisting?

(xxxviii) What are superframes?

2 Marks

(xxxix) Describe the HART congestion control mechanism.

(xl) Describe the working of the wirelessHART network manager.

(xli) How is wirelessHART different from Zigbee?

(xlii) What is RFID? Explain its working.

(xliii) How is RFID different from QR codes?

(xliv) Differentiate between active and passive RFID.

5 Marks

(xlv) List some of the typical applications of RFID.

(xlvi) What is NFC? Describe its working.

(xlvii) How is NFC different from RFID?

2 Marks

(xlviii) What are the different types of NFC? Explain in detail.

(xlix) Describe the various modes of operation of NFC.

(l) List some of the popular applications of NFC.

5 marks

(li) What is ISA 100.11a?

2 Marks

(lii) Describe the various transport services in ISA100.11a.

(liii) What are the various networks permitted in ISA100.11a?

(liv) What network topologies are allowed in ISA100.11a?

(lv) What are the various device types in ISA100.11a?

(lvi) List the salient features of ISA100.11a.

5 marks

(lvii) What are the security features of ISA100.11a?

(lviii) Differentiate between an NRD and backbone device in ISA100.11a.

(lix) Differentiate between an RD and an NRD in ISA100.11a.

(lx) What are the typical usage classes in ISA100.11a?

(lxi) What is Z-Wave?

2 marks

(lxii) Describe the working of a Z-Wave implementation.

10 Marks

(lxiii) Describe GFSK.

(lxiv) What is Manchester encoding?

(lxv) What is healing in the context of Z-Wave?

2 Marks

(lxvi) Differentiate between Z-Wave and Zigbee.

5 Marks

(lxvii) What are the different variants of Weightless? Enumerate the highlighting features of each.

Chapter 8:

Exercises

(i) What are the salient features of 6LoWPAN?

(ii) What is a WPAN?

(iii) Describe the addressing types in 6LoWPAN.

(iv) Describe the LOADng routing.

(v) Describe the RPL routing.

(vi) What are the different header types in 6LoWPAN?

(vii) What constitutes a low power lossy network (LLN)?

(viii) What is AMQP? Describe in detail.

(ix) What are the various message guarantees provided by AMQP? Explain each in detail.

(x) List some of the salient features of AMQP.

(xi) What are the frame types in AMQP?

(xii) Differentiate between OPEN, BEGIN and ATTACH frame types in AMQP.

(xiii) Differentiate between DETACH, END, and CLOSE frame types in AMQP.

(xiv) Differentiate between TRANSFER and FLOW frame types in AMQP.

(xv) What are BINDINGS in the context of AMQP?

(xvi) What are the various types of AMQP exchanges? Describe each.

(xvii) What are the popular applications of AMQP?

(xviii) Explain the working of MQTT

(xix) How is MQTT different from HTTP?

(xx) What are the various MQTT methods?

(xxi) What is SMQTT? How is it different from MQTT?

(xxii) List the salient features of MQTT.

(xxiii) List the salient features of XMPP.

(xxiv) Describe the XMPP protocol.

(xxv) Differentiate between structured and unstructured data.

(xxvi) What is XML?

2 Marks

(xxvii) What is BOSH? Explain in detail.

(xxviii) What is CORE? Explain in detail.

(xxix) What is Jingle? Explain in detail.

(xxx) What is Pub–Sub? Explain in detail.

(xxxi) List the significant limitations of XMPP.

(xxxii) List some of the popular uses of XMPP.

(xxxiii) What is CoAP?

(xxxiv) Describe the working of CoAP.

(xxxv) Explain the various messaging modes in CoAP.

(xxxvi) List the salient features of the CoAP protocol.

(xxxvii) What is REST?

(xxxviii) What are RESTful services?

(xxxix) Describe the LOADng protocol.

(xl) What is a DODAG?

2 Marks

(xli) Explain the mechanism of formation of a DODAG in RPL.

(xlii) Explain the working of RPL protocol.

(xliii) Illustrate the salient features of RPL.

(xliv) How is the global instance different from local instances in RPL?

(xlv) What is QUIC? How is the connection latency reduced in QUIC?

(xlvi) What is the purpose of publishing static configuration records in QUIC?

(xlvii) Highlight the various features of uIP.

5 Marks

(xlviii) What led to the development of nanoIP?

(xlix) How is the CCN paradigm different from traditional networking approaches?

(l) How is the Physical Web able to interact with physical objects and locations? What are its advantages?

(li) How is mDNS different from DNS?

(lii) What are some of the commonly used discovery protocols in IoT?

(liii) What features separate MQTT–SN from MQTT?

(liv) What are the main functional differences between transparent and aggregate gateways in MQTT-SN?

(lv) Differentiate between SOAP and REST.

(lvi) How does SOAP enable communication between two syntactically different devices/machines?

(lvii) What are the functional components of SOAP?

Chapter 12:

Exercises

(i) List the type of sensors which can be used for agricultural IoT.

(ii) Explain two use cases where drones can be used for agricultural IoT.

(iii) Design a scenario where we can use fog computing in agriculture.

(iv) How can agricultural IoT help in the efficient distribution of water in agricultural fields?

(v) What are the roles of the various IoT components in an agri-chain?

(vi) What are the advantages of agricultural IoT?

(vii) List a few communication modules used for agricultural IoT?

(viii) Design a case study to develop an IoT-based agricultural planter. In the case study, you should include the requirement analysis of different components and justify their usability in the planter.

(ix) What is the importance of satellites in agricultural IoT?

10 Marks