(Pages : 4) **L – 2008**

Reg. No. : .....

Name : .....

Sixth Semester B.Sc./B.C.A. Degree Examination, March 2021.

Career Related First Degree Programme under CBCSS

Group 2(b) – Computer Science/ Computer Applications

Core Course/Elective Course

CS 1642/CP 1661.3 – INTERNET OF THINGS (IoT)

(2018 Admission Regular)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Answer **all** questions. Each question carries **1** mark)

1. What are sensors?
2. What is cloud computing?
3. Write the components of Smart Objects.
4. OCTAVE stands for?
5. What is RPL?
6. Expand MEMS.
7. What is WSN?
8. Expand RFID.

P.T.O.

9. What is Actuator?

10. Define MQTT.

SECTION – B

(Answer **any eight** questions. Each question carries **2** marks)

11. List any four advantages of Big Data systems.

12. What is FAIR?

13. What you mean by Data Analytics?

14. Is Machine Learning related to loT? How?

15. Define SCADA.

16. What is fog computing?

17. Define Payload.

18. What is Latency?

19. Describe 6LoWPAN header compression.

20. Write the features of MQTT.

21. List the layers in oneM2M loT Standardized Architecture.

22. What are pressure sensors?

23. What is DNP3?

24. Write a note on CoAP.

25. Describe BAS systems.

26. What are the applications of IoT?

SECTION – C

(Answer **any six** questions Each question carries **4** marks)

27. Discuss about the advantages and disadvantages of IoT.

28. Explain the Communication Protocol for WSN.

29. Write a note on smart objects.

30. Explain how IoT Data Management is done.

31. What are the applications of Big Data systems?

32. What is the connection of Big Data with IoT?

33. Write a note on Smart Connected Buildings.

34. What are HVAC systems?

35. How Cloud Computing is beneficial for IoT?

36. What are the trends in Smart Objects?

37. Why public safety is a major concern in IoT?

38. Write a note on OT security.

SECTION – D

(Answer **any two** questions. Each question caries **15** marks)

39. Discuss about various applications of IoT.

40. Describe IoT World Forum (IoTWF) Standardized Architecture.

41. Explain the simplified IoT Architecture.

42. Discuss about Smart Objects.

43. What are the common challenges in OT security?

44. Explain in detail about SCADA.

———————

Key 2
L 2008

No.of Copies	

For Office Use Only

Question Paper Code

.....

Remarks on Scrutiny

17/02/2021

.....

No. of pages Page No.

SIXTH SEMESTER B.Sc /BCA DEGREE EXAMINATION

CAREER RELATED FDP UNDER CBCSS

Group2(b)- COMPUTER SCIENCE/COMPUTER APPLICATIONS

Core Course /Elective Course
CS1642 /CP 1661.3
Internet of Things (IoT)

(2018 Admission)

Time: 3hours **Maximum Marks: 80**

Answer key

SIXTH SEMESTER BSc/ BCA DEGREE EXAMINATIONS
CAREER RELATED FDP UNDER CBCSS
Group2(b)- COMPUTER SCIENCE AND COMPUTER APPLICATIONS
Core Course/ Elective Course
CS1642/ CP 1661.3
INTERNET OF THINGS (IoT)
(2018 Admission)

Time : 3 hours **Max mark - 80**

ANSWER KEY

Section A

1. The main purpose of sensors is to collect data from the surrounding environment. Sensors, or 'things' of the IoT system, form the front end. These are connected directly or indirectly to IoT networks after signal conversion and processing.
2. Simply put, cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale.
3. Smart, connected products have three primary components: Physical – made up of the product's mechanical and electrical parts. Smart – made up of sensors, microprocessors, data storage, controls, software, and an embedded operating system with enhanced user interface.
4. Operationally Critical Threat, Asset and Vulnerability Evaluation
5. Routing Protocol for Low-Power and Lossy Networks)
6. Micro-Electro-Mechanical Systems
7. Wireless sensor network
8. Radio Frequency IDentification
9. actuator operates in the reverse direction of a sensor. It takes an electrical input and turns it into physical action.
10. Message Queuing Telemetry Transport

Section B

11. Real-time forecasting and monitoring of business as well as the market. Identify crucial points hidden within large datasets to influence business decisions. Promptly mitigate risks by optimizing complex decisions for unforeseen events and potential threats.
12. FAIR (Factor Analysis of Information Risk) is a technical standard for risk definition from The Open Group. While information security is the focus, much as it is for OCTAVE, FAIR has clear applications within operational technology.
13. IoT data analytics is the analysis of huge data volumes generated by connected devices. The combination of IoT and data analytics has already proven to be beneficial in retail, healthcare, telematics, manufacturing, and smart cities.
14. IoT and machine learning deliver insights hidden in IoT data for rapid, automated responses and improved decision making. Machine learning for IoT can be used to project future trends, detect anomalies, and augment intelligence by ingesting image, video and audio.
15. SCADA is a system by which remote devices can be monitored and controlled by a central server. SCADA plays a critical role in the substation, allowing (as the name suggests) controls and data acquisition from remote devices, known as remote terminal units (RTUs) and intelligent electronic devices (IEDs).
16. Fog computing provides services closer to end-users i.e. sensors, IoT devices, mobile phone etc. Therefore, it protects the end users through effective manner as they are near to the layer. It also protects the data through the mode of encryption and isolation.
17. In general, the payload is the data that is carried on behalf of an application. It is usually of variable length, up to a maximum that is set by the network protocol and sometimes the equipment on the route. When necessary, some networks can break a larger packet into smaller packets.
18. Latency is the time it takes for data to be transferred between its original source and its destination, measured in milliseconds.
19. 6LoWPAN header compression is stateless, and conceptually it is not too complicated. However, a number of factors affect the amount of compression, such as implementation of RFC 4944 versus RFC 6922, whether UDP is included, and various IPv6 addressing scenarios.

20. Authentication, Access Control, QoS, Last Will Message, Retain Message etc.
21. oneM2M Layered Model comprises three layers: the Application Layer, the Common Services Layer, the underlying Network Services Layer.
22. Pressure sensors are devices that measure pressure (the force required to stop a fluid from expanding) in gases or liquids. These can come in all sizes and shapes, and they are one of the most popular examples of IoT sensors mainly due to industrial applications that are fully embracing this new connectivity effort.
23. An open, standards-based protocol for the electric utility industry with interoperability between substation computers, remote terminal units, intelligent electronic devices and master stations. The main use of DNP3 is in utilities such as electric and water companies.
24. Constrained Application Protocol (CoAP) is a specialized web transfer protocol for use with constrained nodes and constrained networks in the Internet of Things. CoAP is designed to enable simple, constrained devices to join the IoT even through constrained networks with low bandwidth and low availability.
25. IoT (Internet of Things) has revolutionized Building Automation Systems (BAS). With built-in intelligence, IoT powered BAS makes the building intuitive and proactive while empowering occupants and making control and management easier than ever before.
26. Factory Digitalization, Product flow Monitoring, Inventory Management, Safety and Security, Quality Control, Packaging optimization, Logistics and Supply Chain Optimization.

Section C

27. Advantages- Cost reduction, Efficiency & productivity, Business opportunities, Customer experience, Mobility & agility.
    Disadvantages- Compatibility, Complexity, Privacy/Security
28. Communication protocols need to facilitate routing and message handling for this data flow between sensor nodes as well as from sensor nodes to optional gateways, edge compute, or centralized cloud compute. IoT communication protocols for WSNs thus

straddle the entire protocol stack. Ultimately, they are used to provide a platform for a variety of IoT smart services.

29. Smart Objects (also known as Intelligent Objects) are objects that are equipped with positioning and communication technologies and are integrated into a communication network, the so called Internet of Things (IoT).
30. In fact, the data generated by IoT sensors is one of the single biggest challenges in building an IoT system. In the case of modern IT networks, the data sourced by a computer or server is typically generated by the client/server communications model, and it serves the needs of the application. In sensor networks, the vast majority of data generated is unstructured and of very little use on its own.
31. Explain about applications in Banking and Securities, Communications, Media and Entertainment, Healthcare Providers, Education, Government etc.1. Banking and Securities, Communications, Media and Entertainment, Healthcare Providers, Education, Government etc.
32. Big data analytics is emerging as a key to analyzing IoT generated data from "connected devices" which helps to take the initiative to improve decision making. The role of big data in IoT is to process a large amount of data on a real-time basis and storing them using different storage technologies.
33. The function of a building is to provide a work environment that keeps the workers comfortable, efficient, and safe. Work areas need to be well lit and kept at a comfortable temperature. To keep workers safe, the fire alarm and suppression system needs to be carefully managed, as do the door and physical security alarm systems. While intelligent systems for modern buildings are being deployed and improved for each of these functions, most of these systems currently run independently of each other—and they rarely take into account where the occupants of the building actually are and how many of them are present in different parts of the building.
34. Heating, ventilation, and air conditioning (HVAC) system is designed to achieve the environmental requirements of the comfort of occupants and a process. HVAC systems are more used in different types of buildings such as industrial, commercial, residential and institutional buildings.

35. The role of Cloud Computing in IoT works as part of a collaboration and is used to store IoT data. The Cloud is a centralised server containing computer resources that can be accessed whenever required. Cloud Computing is an easy method of travel for the large data packages generated by the IoT through the Internet.
36. Size is decreasing, Power consumption is decreasing, Processing power is increasing, Communication capabilities are improving, Communication is being increasingly standardized. Explain further
37. IoT poses significant impacts on public safety cybersecurity governance as these devices increase the potential attack surface – both physical and virtual – of a network, and the complexity of user authentication and identity management.
38. Operational Technology (OT) is hardware and software that detects or causes a change through the direct monitoring and/or control of physical devices, processes and events in the enterprise, according to Gartner. OT is common in Industrial Control Systems (ICS) such as a SCADA System.

Section D

39. Write the Applications of IoT and explain them. Hint : Factory Digitalization, Product flow Monitoring, Inventory Management, Safety and Security, Quality Control, Packaging optimization, Logistics and Supply Chain Optimization
40. In 2014 the IoTWF architectural committee (led by Cisco, IBM, Rockwell Automation, and others) published a seven-layer IoT architectural reference model. While various IoT reference models exist, the one put forth by the IoT World Forum offers a clean, simplified perspective on IoT and includes edge computing, data storage, and access. Illustrate with diagram.
41. The IoT Data Management and Compute Stack and the Core IoT Functional Stack. Reducing the framework down to a pair of three-layer stacks in no way suggests that the model lacks the detail necessary to develop a sophisticated IoT strategy. Rather, the intention is to simplify the IoT architecture into its most basic building blocks and then to use it as a foundation to understand key design and deployment principles that are applied to industry-specific use cases.

42. Smart Objects (also known as Intelligent Objects) are objects that are equipped with positioning and communication technologies and are integrated into a communication network, the so called Internet of Things (IoT). Smart, connected products have three primary components: Physical – made up of the product's mechanical and electrical parts. Smart – made up of sensors, microprocessors, data storage, controls, software, and an embedded operating system with enhanced user interface.
43. Erosion of Network Architecture, Pervasive Legacy Systems, Insecure Operational Protocols, Other Protocols, Device Insecurity, Dependence on External Vendors etc.
44. SCADA is a system by which remote devices can be monitored and controlled by a central server. SCADA plays a critical role in the substation, allowing (as the name suggests) controls and data acquisition from remote devices, known as remote terminal units (RTUs) and intelligent electronic devices (IEDs).