Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 22-12-2025 **Time:** 01:00pm – 04:00pm

School: SOCSE	**Program:** B.Tech Computer Engineering	
Course Code: CSE2276	**Course Name:** Introduction to IoT	
Semester: V	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**26**	**26**	**24**	**24**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Define Internet Of Things. Mention any two characteristics of IoT.	**2 Marks**	**L1**	**CO1**
2.	Identify one real-world IoT application that commonly uses **Publisher–Subscriber communication model**.	**2 Marks**	**L1**	**CO1**
3.	Briefly explain the role of Big data in IoT.	**2 Marks**	**L2**	**CO1**
4.	List the characteristics of 6LOWPAN protocol used in IoT.	**2 Marks**	**L1**	**CO2**
5.	Mention the types of RFID tags and give an example for each.	**2 Marks**	**L1**	**CO2**
6.	Summarize the features of Zigbee protocol in IoT.	**2 Marks**	**L1**	**CO2**
7.	What is MQTT? List all the three components in MQTT.	**2 Marks**	**L1**	**CO3**
8.	Name any two IoT cloud platforms that are compatible with ESP8266.	**2 Marks**	**L1**	**CO3**
9.	Differentiate between descriptive and predictive analytics in IoT.	**2 Marks**	**L1**	**CO4**
10.	Define Authentication and Authorization in IoT Security.	**2 Marks**	**L1**	**CO4**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Explain IoT Level-6 architecture with neat diagram. Identify real-world application that can be mapped to IoT Level 6 architecture.	**10 Marks**	**L2**	**CO1**
	b.	A university IoT research lab has been allocated the IP block 30.0.0.0 (Class A). The lab must be divided into 10 equal-sized subnets. i) Calculate the new subnet mask. ii) What is the network address, usable host range, and broadcast address of the 5th subnet? iii) What is the maximum number of IoT devices that can be configured per subnet and total for the 10 subnets (consider only usable hosts)?	**10 Marks**	**L3**	**CO1**
		Or			
12.	**a.**	Explain the primary characteristics of IoT in detail and briefly describe the physical design of IoT.	**10 Marks**	**L2**	**CO1**
	b.	A Bluetooth-enabled smart lock connects only to its owner's smartphone for authentication and access. i)Identify the communication model and explain with neat diagram. ii)Why is this model suitable for security-critical IoT devices? iii) Justify whether this model would be suitable for a large-scale IoT network (e.g., smart city locks).	**10 Marks**	**L3**	**CO1**

13.	**a.**	Interface Bluetooth HC-05 module on Arduino. Develop an Arduino C++ sketch to control an LED using Android App. Compare Zigbee and Bluetooth.	**10 Marks**	**L3**	**CO2**
	b.	Explain the features of 6LOWPAN and its header types.	**10 Marks**	**L2**	**CO2**
		Or			
14.	**a.**	A soil moisture sensor (short address 0xCAFE) sends data to the gateway node (0xBEEF). Since multi-hop forwarding is required, a Mesh Addressing Header is added with Hops Left = 5. The Mesh header is: B5 CA FE BE EF i)Explain the Dispatcher and Mesh Addressing Header ii)Decode the header fields. iii)Show how the Hops Left value changes as the packet travels through intermediate nodes.	**10 Marks**	**L2**	**CO2**
	b.	Apply your knowledge of Arduino and RFID interfacing to design a simple security access system. Illustrate the hardware connections between Arduino Uno and the RC522 RFID reader, and demonstrate how the system verifies card IDs to grant or deny access, displaying the result on the Serial Monitor.	**10 Marks**	**L3**	**CO2**

15.	**a.**	Explain the architecture of a CoAP-based IoT system used for soil-moisture monitoring and irrigation control in agriculture.	**10 Marks**	**L2**	**CO3**

<table>
<tr><td></td><td>b.</td><td>A hospital is implementing an IoT-based patient monitoring system using the MQTT protocol. Each patient is equipped with three sensors — Blood Pressure (BP), Heart Beat (HB), and Temperature — connected to an ESP8266 microcontroller. The ESP8266 acts as an MQTT client (publisher) and sends real-time health readings to an MQTT broker hosted on the hospital's local server. Doctors and nurses use mobile or web dashboards as subscribers to monitor patients' data continuously.I llustrate the working of MQTT protocol and demonstrate the various methods of MQTT for the given requirements. Mention any two advantages and disadvantages of MQTT.</td><td>10 Marks</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="5">Or</td></tr>
<tr><td>16.</td><td>a.</td><td>Compare MQTT, AMQP, CoAP and XMPP. (Any 10 differences).</td><td>10 Marks</td><td>L3</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>A Smart Environmental Monitoring System is deployed in a laboratory. Sensor 1 (DHT22) — measures temperature and humidity and Sensor 2 (MQ135) — measures air quality (CO_2, NH_3, etc.). Both are connected to ESP8266 microcontrollers which send readings via AMQP to a RabbitMQ broker. • RabbitMQ (the broker) routes these readings to appropriate queues where backend applications consume them. Illustrate the working of AMQP with neat diagram.</td><td>10 Marks</td><td>L3</td><td>CO3</td></tr>
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<tr><td>17.</td><td>a.</td><td>Define IoT Analytics. Mention its role in converting raw IoT data into actionable insights.Also briefly explain the role of feature extraction in IoT data preprocessing?</td><td>10 Marks</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>A DHT22 sensor node in an industrial environment records temperature and humidity data to predict whether the machine is in a normal or faulty state.
You are given the following training data:
<table>
<tr><th>Temperature (°C)</th><th>Humidity (%)</th><th>Machine State</th></tr>
<tr><td>30</td><td>70</td><td>Normal</td></tr>
<tr><td>32</td><td>68</td><td>Normal</td></tr>
<tr><td>34</td><td>65</td><td>Faulty</td></tr>
<tr><td>35</td><td>62</td><td>Faulty</td></tr>
<tr><td>36</td><td>60</td><td>Faulty</td></tr>
</table>
A new reading arrives: (33°C, 66%).
Using K = 3, classify the machine state using Euclidean distance.
Apply K-Nearest Neighbors (KNN) for Predictive Maintenance in IoT.</td><td>10 Marks</td><td>L3</td><td>CO4</td></tr>
<tr><td colspan="5">Or</td></tr>
<tr><td>18.</td><td>a.</td><td>Explain the end-to-end IoT security architecture for a smart home system (sensors → gateway → cloud). Highlight encryption, authentication, and access-control mechanisms at each layer.</td><td>10 Marks</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>Describe security challenges in IoT data analytics and how encryption/anonymization protect sensitive sensor data in cloud analytics.</td><td>10 Marks</td><td>L3</td><td>CO4</td></tr>
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