JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

B.Tech-VIII Semester (BI)

COURSE CODE (CREDITS): 25B1WCI835 (3) MAX MARKS: 25

COURSE NAME: FOG COMPUTING AND IOT

COURSE INSTRUCTOR: AAYUSH SHARMA MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	**(a)** Define a Wireless Sensor Network (WSN). Draw a neat labelled diagram showing the following components and the data flow between them: sensor nodes, cluster heads, sink node (base station), and the end user/cloud. **(b)** A flat (non-hierarchical) sensor network has 500 nodes, each transmitting data directly to a single base station. A hierarchical (cluster-based) design groups the same 500 nodes into 25 clusters of 20 nodes each, where each node sends data to its cluster head, and only the cluster head communicates with the base station. (i) How many total wireless transmissions occur per sensing round in the flat design vs. the hierarchical design? (iii) Which design extends battery life and by what factor? **(c)** Name and briefly explain (one sentence each) any two routing protocols used in wireless sensor networks. For each, state whether it is flat or hierarchical.	[CO2]	[3+3+2]
Q2	**(a)** What is a load balancer in the context of IoT cloud infrastructure? Explain with a diagram how a load balancer distributes incoming sensor data streams across multiple backend servers. **(b)** An IoT platform has three servers behind a load balancer. The SLA guarantees **99.9% uptime** (per year). Each server individually has 99.5% uptime. (i) If the load balancer uses an **active-passive** (failover) model with one primary and two backup servers, calculate the overall system availability. (ii) The SLA also promises a maximum API response time of 200 ms. During a traffic spike, the average response time rises to 350 ms. What is this situation called in SLA terminology, and what typically happens as a consequence? **(c)** Define SLA (Service Level Agreement) in the context of IoT cloud services. List any four key metrics that are typically included in an IoT SLA.	[CO3]	[3+3+3]
Q3	**(a)** Define MQTT. Draw a neat labelled diagram showing the roles of Publisher, Broker, and Subscriber. Explain the publish-subscribe model in 2–3 sentences. **(b)** MQTT defines three Quality of Service (QoS) levels: 0, 1, and 2. State the name and meaning of each level in one sentence. A smart home has a temperature sensor publishing every 10 seconds and a smoke detector publishing on alarm. Which QoS level would you assign to each and why?	[CO3]	[4+4]