JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B.Tech-VI Semester (CSE/IT/ECM)

COURSE CODE (CREDITS): 19B1WCI635 (02)   MAX. MARKS: 35

COURSE NAME: Architecting Distributed Cloud Applications

COURSE INSTRUCTORS: ARV   MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for

solving problems

1.   Answer the following Questions: [CO-3][2+2+6]

(a) A system processes messages from a queue using 4 consumers working in parallel. If each consumer can process 10 messages per minute, what is the total processing capacity of the system in messages per hour?

(b) A message queue receives an average of 2,400 messages per hour. If the queue can process messages at a rate of 50 messages per minute, will the queue be able to handle the incoming load without backlog?

(c) How do messages get processed in case of faults in distributed cloud systems? Discuss the various additional features offered by Messaging queues that enhance their functionality, reliability, and usability in distributed cloud systems.

2.   Answer the following Questions: [CO-4][2+2+6]

(a) During a Rolling Update, a company updates 5% of their 100 instances at a time. Each batch update takes 15 minutes. How long will it take to complete the entire rolling update?

(b) A company is planning to deploy a Blue-Green deployment strategy for their application updates. They have two environments: Blue (current production) and Green (staging). If the deployment to the Green environment takes 30 minutes and the switch from Blue to Green takes 10 minutes, how much total downtime will the users experience during the deployment?

(c) Explain the concept of blue-green deployment and how it minimizes downtime during updates. What are the advantages of using blue-green deployment over traditional update methods? Describe the process of performing a rollback in a blue-green deployment scenario.

3. Answer the following Questions: [CO-4][2+2+2+4]

   (a) A distributed system with 15 nodes uses a leader election process that takes 1 minute to complete. If the leader fails every 30 minutes on average, how many leader elections will be conducted in a 24-hour period?

   (b) A system with 6 nodes uses a lease-based leader election where each lease lasts for 5 minutes. If the leader is always re-elected, how many lease renewals occur in a 2-hour period?

   (c) A leader election algorithm takes 10 seconds to complete. If a distributed system with 10 nodes uses this algorithm and a new leader must be elected every time the current leader fails, and leader failures occur once every hour on average, how much time is spent on leader elections in a 24-hour period?

   (d) Discuss the process of leader election via a lease in distributed cloud systems?

4. Explain the CAP theorem and its implications for data consistency in distributed cloud systems. Compare and contrast strong consistency and eventual consistency in the context of distributed cloud systems. [CO-4][5]