MCA 4 Sem Imp List

📘 1. Information Security and Cryptography

1. Define cryptography and its goals.
2. Differentiate between symmetric and asymmetric cryptography.
3. Explain Caesar cipher and monoalphabetic cipher.
4. Describe the working of DES algorithm.
5. Explain RSA algorithm with example.
6. What is a digital signature? How is it generated?
7. Describe hash functions and their applications.
8. Explain authentication protocols.
9. What are man-in-the-middle and replay attacks?
10. Discuss intrusion detection systems.
11. Define firewall and explain types.
12. What is public key infrastructure (PKI)?
13. Explain Kerberos authentication system.
14. What is message integrity? How is it achieved?
15. Compare block and stream ciphers.
16. Explain key distribution techniques.
17. What is steganography? Give applications.
18. Discuss threats to network security.
19. What is SSL/TLS and how does it ensure security?
20. Explain the concept of digital envelope.

☁️ 2. Cloud Computing

1. What is cloud computing? List its characteristics.
2. Compare cloud and traditional computing.
3. Differentiate between public, private, and hybrid clouds.

4. Explain IaaS, PaaS, and SaaS with examples.
5. Define virtualization and hypervisor.
6. Explain architecture of AWS / Google Cloud.
7. What is containerization? Compare Docker vs VM.
8. List and explain cloud service providers.
9. What is cloud resource provisioning?
10. Discuss challenges in cloud security.
11. Define cloud bursting and autoscaling.
12. What is edge computing?
13. Compare multi-cloud and hybrid-cloud strategies.
14. Discuss data backup and disaster recovery in cloud.
15. What are SLAs in cloud computing?
16. Describe service orchestration.
17. What is serverless computing?
18. Explain cloud deployment lifecycle.
19. What are the advantages of cloud for startups?
20. Discuss cloud monitoring and logging tools.

🔎 3. Data Mining Concepts and Techniques

1. Define data mining and its process.
2. What is KDD (Knowledge Discovery in Databases)?
3. Differentiate between classification and clustering.
4. Explain decision tree algorithm (ID3, C4.5).
5. What is overfitting in classification?
6. Describe K-means clustering with example.
7. Explain association rule mining.
8. Discuss Apriori algorithm.
9. What is lift and support in association rules?

10. Explain web mining and its types.
11. What is text mining? Applications?
12. Define data preprocessing steps.
13. Compare supervised vs unsupervised learning.
14. Explain anomaly detection.
15. What is outlier analysis?
16. Describe data warehousing and OLAP.
17. What is a confusion matrix?
18. What is market basket analysis?
19. Compare content-based and collaborative filtering.
20. Write short notes on data cube and roll-up/drill-down.

👨‍💻 4. Object Oriented Software Engineering

1. What is OOSE? Explain its benefits.
2. Explain software development life cycle (SDLC).
3. Describe use-case driven development.
4. Explain the structure of a use case diagram.
5. Draw class and object diagrams with example.
6. What is cohesion and coupling?
7. Explain activity and sequence diagrams.
8. What is software configuration management?
9. Define software metrics.
10. Explain version control system (Git, SVN).
11. What is SRS? What are its characteristics?
12. Describe software testing types (unit, integration).
13. What is object-oriented modeling?
14. Explain principles of object-oriented design.
15. Discuss role of UML in OOSE.

16. Explain user interface design principles.
17. What is project risk and how is it handled?
18. Explain agile methodology in OOSE.
19. What is software validation?
20. Discuss design patterns (e.g., Singleton, Factory).

🧠 **5. Elective-I (Choose any one)**

a. Distributed Systems

1. Define distributed system and list its goals.
2. What is transparency in distributed systems?
3. Explain client-server and peer-to-peer models.
4. Describe remote procedure calls (RPC).
5. What is clock synchronization?
6. Compare logical vs physical clocks.
7. Describe distributed file system (DFS).
8. Explain consistency models.
9. Discuss mutual exclusion in distributed systems.
10. Explain Lamport's logical clocks.
11. What is fault tolerance?
12. Explain distributed transaction management.
13. Describe 2-phase commit protocol.
14. What are mobile agents?
15. What is middleware in distributed systems?
16. Explain vector clock.
17. What is distributed shared memory (DSM)?
18. Discuss advantages of distributed systems.
19. Describe message passing systems.
20. What is load balancing?

b. Internet of Things (IoT)

1. What is IoT? Explain with examples.
2. List IoT layers and their functions.
3. Compare MQTT and CoAP protocols.
4. Describe IoT architecture.
5. What are sensors and actuators?
6. Explain role of cloud in IoT.
7. What is sensor cloud?
8. Explain use cases in smart homes.
9. What is ZigBee and its role in IoT?
10. Discuss IoT in agriculture.
11. What are IoT security challenges?
12. Define embedded systems in IoT.
13. Explain edge and fog computing.
14. What is IoT gateway?
15. Explain data acquisition in IoT.
16. Discuss wearable devices and applications.
17. What is IPv6 and its need in IoT?
18. Describe smart city application of IoT.
19. What are power constraints in IoT?
20. What is LPWAN?

c. Image Processing

1. Define image processing and its applications.
2. Differentiate analog and digital image processing.
3. What is histogram equalization?
4. Explain image enhancement techniques.
5. Describe spatial filtering.
6. What are edge detection techniques?

7. Explain Sobel and Prewitt operators.
8. What is image segmentation?
9. Explain thresholding.
10. Define morphological operations.
11. Explain erosion and dilation.
12. What is image compression?
13. Describe color image processing.
14. Explain Fourier Transform in image processing.
15. What is noise and filtering?
16. Compare median and Gaussian filters.
17. Describe region growing segmentation.
18. What is object recognition?
19. Explain basic steps of image analysis.
20. Applications of image processing in medical field.