

2026

6th Semester Examination (CCFUP : NEP)

COMPUTER SCIENCE

Paper : MDSE 2-T

(Single Core Major Elective-2)



*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

[Internet of Things (IoT)]

Full Marks : 40

Time : Two Hours

Group - A

Answer any *five* questions : 2×5=10

1. What is an IoT communication model?
2. What is an API in IoT?
3. What is device-to-device communication in IoT?
4. What is IoT protocol stack?
5. What is the purpose of Hadoop?
6. What do you mean by cloud data analytics?
7. What is Raspberry Pi?
8. What is SDN (Software Defined Networking)?

P.T.O.

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Group - B

Answer any *four* questions : 5×4=20

9. Demonstrate the IoT Components with a diagram.
10. What is the difference between M2M and IoT? Mention the communication protocols used for M2M local area networks. 2+3
11. Explain the role of embedded systems in IoT devices.
12. Explain the role of Google Cloud Platform in IoT systems.
13. Explain the role of big data analysis in IoT. What are the characteristics of big data? 2+3
14. Describe Bluetooth Low Energy (BLE) and its advantages.

Group - C

Answer any *one* question : 10×1=10

15. Illustrate the various IoT communication APIs. 10
16. Explain IoT analytics and its role in decision-making. Explain IoT applications in smart homes, industries, and healthcare. 5+5

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OR

[Cloud Computing]

Full Marks : 40

Time : Two Hours

Group - A

Answer any *five* questions : 2×5=10

1. What is a Service Level Agreement (SLA)?
2. Define Grid Computing.
3. What is Amazon EC2?
4. What is Microsoft Azure?
5. What is the role of virtualization in cloud computing?
6. Compare public and private cloud models.
7. What are the advantages of hybrid cloud?
8. Mention two security challenges in cloud computing.

Group - B

Answer any *four* questions : 5×4=20

9. Explain the differences between Cluster Computing and Distributed Computing.
10. What are the features of Google App engine?
11. Describe different deployment models in cloud computing.
12. Explain cloud service life cycle using a diagram.

P.T.O.



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13. Discuss the role of cloud storage in big data and modern applications.
14. Explain DevOps in cloud computing with tools and practices.

Group - C

Answer any *one* question : 10×1=10

15. Discuss cloud security issues and challenges in detail.
16. Explain different service models (IaaS, PaaS, SaaS) with examples.



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OR

[Block-Chain]

Full Marks : 60

Time : Three Hours

Group - A

Answer any *ten* questions : 2×10=20

1. Define a distributed ledger in the context of blockchain systems.
2. State the Byzantine Generals problem and its relevance to blockchain consensus.
3. Why did Nakamoto propose a blockchain-based cryptocurrency instead of using a traditional centralized ledger?
4. Define a cryptographic hash function and list any one desirable property.
5. What is digital cash?
6. What is meant by a "fault" in a distributed system?
7. Write the role of proof of work (PoW) in the Bitcoin blockchain.
8. What is public key cryptography?
9. What is a zero-knowledge proof?
10. What does it mean to say that the Ethereum Virtual Machine (EVM) is Turing complete?



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11. Define pseudo-anonymity in the context of blockchain addresses.
12. What is a smart contract in Ethereum?
13. What is a block header in the Bitcoin blockchain?
14. What are digital signatures?
15. What is verifiable random function (VRF)?

Group - B

Answer any *four* questions : $5 \times 4 = 20$

16. Describe collision resistance and preimage resistance for hash functions, and explain why both are important for blockchain integrity.
17. Describe Sybil attacks in the context of blockchain networks and explain one strategy used by blockchains to mitigate such attacks.
18. Write a short note on atomic broadcast and explain its relationship with consensus in distributed systems.
19. Explain consensus algorithms in distributed systems. Why do they face scalability challenges? $2+3$
20. Explain puzzle-friendly hash functions and discuss why they are essential for the security of proof-of-work based blockchains.



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21. Explain the idea of proof of stack (PoS) and mention two advantages and two drawbacks of PoS compared to PoW.

Group - C

Answer any *two* questions : $10 \times 2 = 20$

22. Explain the need for distributed record keeping in modern systems. Discuss how blockchain addresses trust, transparency, and immutability issues compared to traditional centralized systems. $5+5$
23. Describe Blockchain 2.0. Compare Bitcoin scripting with Ethereum smart contracts. $5+5$
24. Discuss the fundamental design of the Bitcoin blockchain. Highlight two major limitations faced by Bitcoin. $5+5$
25. Explain Hyperledger Fabric architecture. Discuss its components. $3+7$



P.T.O.

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OR

[Embedded System]

Full Marks : 60

Time : Three Hours

Group - A

Answer any *ten* questions :

2×10=20

1. What is System on Chip (SoC)?
2. What is IEEE 488 bus?
3. What is an application-specific embedded system?
4. What is RS232?
5. Define serial bus.
6. Define target system.
7. What is in-circuit debugging?
8. Define preemptive scheduling.
9. What is Round Robin scheduling?
10. State one advantage of RS485 over RS232.
11. Define semaphore in RTOS.
12. Define ISR (Interrupt Service Routine).
13. What is SHARC processor mainly used for?
14. What is emulator?
15. What is EEPROM?



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Group - B

Answer any *four* questions :

5×4=20

16. Describe the architecture and working of UART communication.
17. Compare RS232, RS422 and RS485 communication interfaces in terms of transmission mode, distance, noise immunity and applications.
18. a Round Robin scheduler executes four tasks T1, T2, T3 and T4 with time quantum 5 ms. The CPU burst times are 12 ms, 7 ms, 10 ms and 6 ms respectively. Draw the scheduling sequence and calculate total execution time.
19. Explain the operation of IEEE 488 bus.
20. Explain the classification of embedded systems with examples.
21. Compare ARM and SHARC processors.

Group - C

Answer any *two* questions :

10×2=20

22. An RTOS system contains three periodic tasks :
 - T1 executes every 20 ms and requires 5 ms CPU time
 - T2 executes every 50 ms and requires 10 ms CPU time

P.T.O.



- T3 executes every 100 ms and requires 15 ms CPU time

Determine CPU utilization and comment whether the system is schedulable.

23. Draw and explain the architecture of RTOS kernel. Discuss the roles of scheduler, ISR, semaphores, message queues and pipes.
24. Design a smart embedded monitoring system using ARM processor, RTOS and RS485 communication. Draw the block diagram and explain scheduling, communication and interrupt handling mechanisms.
25. Explain GPRS-based embedded communication systems with suitable block diagram. Discuss wireless data transfer mechanisms.

