लोक सेवा आयोग

गुठी संस्थान, विविध, सूचना प्रविधि, अधिकृत तृतीय, सहायक प्रशासक/सूचना प्रविधि अधिकृत पदको खुला प्रतियोगितात्मक लिखित परीक्षा

२०८२।०८।०६

पत्र : द्वितीय
समय : ३ घण्टा

पूर्णाङ्क : १००

विषय : Technical Subject

प्रत्येक **Section** को उत्तर छुट्टाछुट्टै उत्तरपुस्तिकामा लेख्नुपर्नेछ । अन्यथा उत्तरपुस्तिका रद्द हुनेछ ।

Section "A" — 50 Marks

1. Convert the hexadecimal number F3A5 to its equivalent binary and octal representations. Furthermore, using two's complement notation, perform the binary subtraction 25 - 37 using 8-bit registers. Show all steps and indicate if overflow occurs. 5
2. Given a hash table of size 7 and a hash function h(key) = key % 7, insert the keys 15, 22, 8, 22, 13 in the given order. Show the final state of the table after all insertions using: 5
   a) Separate Chaining for collision resolution.
   b) Linear Probing for collision resolution.
   (Assume duplicates are handled according to the collision strategy.)
3. Differentiate between Depth-First Search (DFS) and Breadth-First Search (BFS) with suitable trees and examples. Write down the algorithms for DFS and BFS with basic codes. 5+5=10
4. Compare and contrast two software development models from the following list: Waterfall, Prototype, Spiral and Agile. Discuss the advantages and disadvantages of each and in what services each model would be most appropriate. 4+6=10
5. What is virtual memory and why is it required? Explain with suitable examples. Draw the basic block diagram of operating system process and explain it. 5+5=10
6. Describe and compare linear search and binary search algorithms in terms of their working, time complexity and use cases. Explain the roles of compilers, interpreters and translators in program execution. How do they differ in terms of functionality, speed and use cases? Give your answer with suitable examples. 5+5=10

Section "B" — 50 Marks

7. Describe the roles of DHCP and DNS in the TCP/IP protocol suite. How do these services work together to enable network communication? Clarify. 5
8. Differentiate between SAAS and PAAS systems in the closed computing with simple examples. List the main features of National Cyber Security Policy, 2023. 3+2=5
9. Differentiate between structured query language (SQL) and NoSQL with suitable practical examples. Explain 3.5 NF with suitable example. 4+6=10

10. Explain the fundamental concepts of RISC and CISC architectures. Detail the key differences between them. Additionally, describe the components of a CPU and the role of the control unit within it. 3+4+3=10

11. Answer the followings: (2+3)+2+(2+1)=10

    a) An enterprise wants to integrate its siloed Finance, HR and Supply Chain systems. Enterprise Recourse Planning (ERP) is proposed as a solution.

        i) Describe the fundamental architecture of an ERP system and its key benefits.

        ii) What are the significant challenges (e.g., cost, BPR, vendor lock-in) associated with its implementation?

    b) How can Blockchain technology potentially disrupt traditional ERP system, particularly in areas like supply chain provenance, smart contracts for procurement and auditable transaction logs? Discuss one specific use case.

    c) The successful implementation of systems like ERP and Blockchain often depends on a supportive national policy framework.

        i) Explain two key objectives of Nepal's National Cyber Security Policy, 2023, that would be relevant to an enterprise deploying an ERP system.

        ii) How does the Electronic Transactions Act, 2063 provide legal validity to digital records and why is this crucial for blockchain-based audit logs?

12. What is a Decision Support System (DSS)? How does it differ from Enterprise System such as ERP, CRM and SRM? Explain the purpose of each system and how they contribute to effective decision-making and business operations. 2+2+6=10

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