

सामाजिक सुरक्षा कोष
विविध सेवा, कम्प्युटर इन्जिनियरिङ समूहको, नवौ तह, उपनिर्देशक पदको खुला र आन्तरिक
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीय पत्र: सेवा सम्बन्धी

Section A: 50 Marks

(3 Questions × 10 Marks & 1 Question × 20 Marks)

1. Computer Architecture

- 1.1. Basic Structures : sequential circuits, design procedure, state table and state diagram, Von Neumann/Harvard architecture, RISC/CISC architecture
- 1.2. Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle
- 1.3. Processing Unit: instruction formats, arithmetic and logical instruction
- 1.4. Addressing modes
- 1.5. Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, Direct Memory Access (DMA)
- 1.6. Arithmetic Operations
- 1.7. Memory Systems

2. Operating System

- 2.1. Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
- 2.2. Scheduling: Concept and algorithms
- 2.3. Memory Management
- 2.4. Input Output and Files: I/O devices and its organization, Principles of I/O software and hardware, Disks, Files and directories organization, File System Implementation
- 2.5. Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters
- 2.6. Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system

3. Computer Networks

- 3.1. Protocol stack, OSI and TCP/IP models
- 3.2. Link Layer: services, error detection and correction, multiple access protocols, LAN addressing and ARP (Address Resolution Protocol), Ethernet, CSMA/CD multiple access protocol, Hubs, Bridges, and Switches, Wireless LANs, PPP(Point to Point Protocol), Wide area protocols
- 3.3. Network Layer :services, datagram and virtual circuits, routing principles and algorithms, Internet Protocol(IP), IP addressing, IP transport, fragmentation and assembly, ICMP (Internet Control Message Protocol), routing on the internet, RIP (Routing Information Protocol), OSPF (Open Shortest Path First), IPv6
- 3.4. Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
- 3.5. Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming

4. Database Management System

- 4.1. The relational model, ER model
- 4.2. Structured Query Language (SQL)
- 4.3. Functional dependency, normalization and relational database design,
- 4.4. Transaction Management and Concurrency Control: Concurrent execution of the

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- user programs, transactions, Concurrency control techniques
- 4.5. Crash Recovery: types of failure, Recovery techniques
 - 4.6. Query Processing and Optimization
 - 4.7. Indexing: Hash based indexing, Tree based indexing
 - 4.8. Distributed Database Systems and Object oriented database system
 - 4.9. Data Mining and Data Warehousing
 - 4.10. Database Security
- 5. Software Engineering**
- 5.1. Software process: The software life cycle models, risk-driven approaches
 - 5.2. Software project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
 - 5.3. Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review, feasibility analysis
 - 5.4. Software design: Design for reuse and with reuse, design for change, design notations, design evaluation and validation
 - 5.5. Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
 - 5.6. Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
 - 5.7. SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

Section B: 50 Marks

(3 Questions × 10 Marks & 1 Question × 20 Marks)

- 6. Information Systems**
- 6.1. Information Systems (IS) fundamentals
 - 6.2. Information system development
 - 6.3. Decision support system
 - 6.4. Enterprise Resource Planning
 - 6.5. Customer Relationship Management and Supplier Relationship Management
 - 6.6. Management Information System (MIS)
 - 6.7. MIS & its importance in organization
 - 6.8. Information technology infrastructure
 - 6.9. Application of MIS
 - 6.10. Ethical & social impact of IS
- 7. E-Commerce Technology**
- 7.1. Introduction to E-Commerce
 - 7.2. Business models of E-Commerce
 - 7.3. Electronic data interchange
 - 7.4. Mobile commerce
 - 7.5. Technology for online business
 - 7.6. Business applications of E-Commerce

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- 7.7. Electronic payment system
- 7.8. Security issues of E-Commerce
- 7.9. PKI and digital signature
- 7.10. Encryption and decryption methods

8. Data Warehouse & Data Mining

- 8.1. Data warehousing
 - 8.1.1. Need for data warehousing, trends in data warehousing
 - 8.1.2. Planning and requirement
 - 8.1.3. Architecture, infrastructure and metadata
 - 8.1.4. Data design and representation (principals of dimensional modeling, data extraction, transformation and loading, data quality)
 - 8.1.5. Information access and delivery (matching information to classes of users, OLAP in data warehousing, DW and web)
 - 8.1.6. Implementation and maintenance (Physical design process, DW development, growth and maintenance)
- 8.2. Data mining
 - 8.2.1. Data mining algorithms: Classification, clustering, association rules
 - 8.2.2. Knowledge discovery: KDD process
 - 8.2.3. Web mining: Web content mining, web structure mining, web using mining
 - 8.2.4. Spatial and temporal mining; Visualization

9. IT Strategy

- 9.1. Strategic use of IT
- 9.2. Porter 5 Forces model
- 9.3. Formulating long-term objectives
 - 9.3.1. Long-term objectives
 - 9.3.2. Generic strategies
 - 9.3.3. Grand strategies
 - 9.3.4. The value disciplines
- 9.4. Strategic analysis and choices
- 9.5. Value chain analysis
- 9.6. SWOT analysis
- 9.7. Core competencies
- 9.8. Strategy control and continuous improvement
- 9.9. Strategy implementation

10. IT Project Management

- 10.1. Requirement engineering
- 10.2. PERT / CPM network
- 10.3. Investment analysis and breakeven analysis
- 10.4. Time value of money
- 10.5. Financial analysis
- 10.6. Software Configuration Management (SCM)
- 10.7. Team building approach
- 10.8. Issue tracking and management