

FIRST SEMESTER EXAMINATION (SET - B)

Paper Code: <BCA-101> Fundamentals of Computers & IT
Subject: FCIT (Foundations & Computing Systems)

Maximum Marks: 40
Time: 2 Hours

COURSE OUTCOMES:

CO1: Comprehend Von Neumann architecture, memory hierarchy, & data encoding.
CO3: Analyze network topologies, transmission media, & protocol suites.
CO5: Master UNIX/Linux CLI shell utilities, permissions, & the Vi editor.

CO2: Contrast OS architectures, multi-programming paradigms, & kernel services.
CO4: Evaluate relational DBMS versus legacy file systems & normalization.
CO6: Synthesize cybersecurity mitigation & Internet service protocols.

Note: Attempt all questions. Internal choice is indicated. (Total: 40 Marks)

SECTION A					
Q. No.	Questions	Marks	Unit No.	CO Mapped	Bloom's Level
Q1	Answer all parts (Short Notes / Conceptual Analysis): [5 × 2 = 10 Marks]				
(a)	Differentiate between Direct Memory Access (DMA) and Interrupt-driven I/O. Why is DMA crucial for high-throughput secondary storage controllers?	2	1	CO1	2
(b)	Explain how an Even Parity bit detects single-bit transmission errors. Construct the 8-bit encoded codeword for ASCII character 'M' (Binary: 1001101).	2	1	CO1	3
(c)	What is Thrashing in a virtual memory system? Explain the relation between page fault frequency and multiprogramming degree.	2	2	CO2	2
(d)	Compare Single-Mode versus Multi-Mode Fiber Optic Cable in terms of core diameter, dispersion losses, operational bandwidth, and transmission range.	2	3	CO3	2
(e)	Explain the role of the Inode table in UNIX file systems. What metadata elements are stored in an inode versus directory entry?	2	4	CO5	2
SECTION B					
Q. No.	Questions	Marks	Unit No.	CO Mapped	Bloom's Level
Q2.	(a) Explain the structural classification of computer generations from 1st to 5th Generation. Detail the evolution of switching devices, primary memory technologies, OS eras, and execution speeds. (b) Perform binary arithmetic using 2's complement method : Subtract $(43)_{10}$ from $(29)_{10}$ using an 8-bit register representation. Clearly indicate end-around carries and overflow status.	10	1	CO1	3
OR					
	(a) Detail the internal architecture and operational mechanism of magnetic hard disk drives (HDD) versus Solid State Drives (SSD). Compare track/sector seek latency versus NAND flash wear-leveling. (b) Explain character encoding systems: ASCII, EBCDIC, and Unicode (UTF-8, UTF-16). Discuss why modern operating systems standardized on Unicode.	10	1	CO1	3
Q3.	(a) Describe the Process Life Cycle in modern operating systems (New, Ready, Running, Waiting, Terminated). Differentiate between Short-Term, Medium-Term, and Long-Term Schedulers. (b) Define the software translation pipeline: Explain the roles of the Lexical Analyzer, Syntax Analyzer, Linker, and Loader in generating executable binaries from source code.	10	2	CO2	3
OR					
	(a) Explain the Three-Tier Schema Architecture (External, Conceptual, Internal) of DBMS. How does this architecture achieve Physical and Logical Data Independence? (b) What are the disadvantages of file-based systems? Explain how DBMS prevents anomalies (Insertion, Deletion, and Update) through relational schema normalization.	10	2, 3	CO4	4
Q4.	(a) Analyze the functions and header protocols of each layer in the TCP/IP Protocol Suite (Application, Transport, Internet, Network Access). Contrast TCP and UDP mechanisms. (b) What is DNS (Domain Name System)? Describe the hierarchical resolution flow (Root, TLD, Authoritative) and explain the functioning of the DHCP protocol in dynamic IP leasing.	10	3, 4	CO3, CO6	4
OR					
	(a) Explain the UNIX directory tree hierarchy (/bin, /etc, /var, /home, /dev). Differentiate between hard links and soft/symbolic links with syntax and inode implications. (b) Explain the syntax, flags, and outputs of these UNIX utilities: (i) <code>awk '{print \$1, \$NF}' data.csv</code> , (ii) <code>ps -ef grep httpd</code> , (iii) <code>sed 's/foo/bar/g' input.txt</code> , and (iv) <code>kill -9 <PID></code> .	10	4	CO5	3