SEMESTER I (B. Sc. IT)

0202155: INTRODUCTION TO INFORMATION THEORY AND APPLICATIONS

Full Marks: 100

Introduction to Information Theory Marks: 16

Introduction; Data and Information; Information System: Characteristics of Useful Information, Information System Process, Computer Based Information Systems; Information Theory: Efficient Encodings, Measuring Information Content, The Intuition Behind the –P log P Formula, Applications of Information Theory; Software Concepts: Importance of Software Application, Programming Language, Types of Software

Computer Fundamentals Marks: 14

Introduction; Definition of Computer; Essential Features; Characteristics; History; Computer Generations; Computer Classification

Computer Peripherals Marks: 17

Introduction; Basic Computer Components; Functional Units: Arithmetic Logical Unit (ALU), Control Unit (CU), Central Processing Unit (CPU); Types of Computer Memory; Primary Memory: (RAM), (ROM), (Small, Fast RAM), Registers; Secondary Storage: Magnetic Tape, Magnetic Disk, Floppy Disk, Optical Disk, Flash Memory, USB Drives, Removable Hard Drives, Smart Cards, Optical Cards; Input Output Devices; Input Devices; Output Devices

Computer Operations and Languages Marks: 17

Introduction; Computer Arithmetic; Binary Number System: Counting in Binary, Binary Arithmetic, Conversion of Binary, Decimal, Hexadecimal and Octal Number Systems, 1's and 2's Complement of Binary Number; Floating Point Arithmetic; Arithmetic Through Stacks; Computer Language: Machine Language, Assembly Language, High-Level Language; Operating System (OS); Instruction Cycle; Program Flow of Control With and Without Interrupts

Communication Marks: 16

Introduction; Analog and Digital Communication: Transmission Impairments, Signal to Noise Ratio, Hamming Error-Correction Codes, Channel Capacity; Communication Channels: Wired Channels, Wireless Channels; Transmission Technology: Broadcast Networks, Point-to-Point or Switched Networks; Modulation

Computer Networks Marks: 20

Introduction; Types: Local Area Network, Wide Area Network, Difference Between LAN and WAN, Other Types of Networks, Network Topology; ISO OSI model: Layers of OSI Model, Protocol, IP Address, TCP/IP Protocol; The Internet; WWW; Clients and servers, Ports: Uses of Computer Ports, Types of Ports; Domain Name Service; WWW, Browsers Connections; WWW Browsers: Web Page, URL, Web Server, HTTP, HTML Using the WWW: Web Browser, Searching for Information, Search Techniques; Blogs: Wikis, Electronic Social Network, Micro Blogging, RSS, Web 3.0; Electronic Mail

Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherall. (2010). *Computer Networks*. Prentice Hall Publication.5th Edition. Pages 960.
2. B. Ram,(2000). *Computer fundamentals: architecture and organisation*. New Age International publications; p-512.

3. Behrooz Parhami. (2009). *Computer arithmetic: algorithms and hardware designs*. Oxford University Press. 2nd Edition. Pages 641.
4. D.C. Hankerson , Greg A. Harris, Peter D. Johnson Jr., (2003). *Introduction to Information Theory and Data Compression (Discrete Mathematics and Its Applications).* 2nd Edition. Chapman and Hall/CRC publication; p384.
5. Daniel I.A. Cohen. (1986). *Introduction to Computer Theory*. John Wiley & Sons Inc.; p832.

0202154: MATHEMATICS I

Full Marks: 100

Determinants and Matrices Marks: 18

Definition of a Determinant: Principal Diagonal, Minors and Co-factors, Properties, Symmetry, Cramer's Rule for solving Simultaneous Equations, Adjugate (or Adjoint) of a Determinant; Definition of a Matrix: Types, Addition and Subtraction, Matrix Scalar Multiplication, Matrix Multiplication, Conjugate of a Matrix, Adjoint of a Matrix, Inverse of a Matrix, Solution of Simultaneous Equations; Difference between Determinant and Matrix

Eigen Values and Eigen Vectors Marks: 16

Introduction; Meaning and Definition; Computation of Eigenvectors and Eigenvalues; Properties of Eigenvectors and Eigenvalues

Differential Equation of First Order and First Degree Marks: 18

Derivative of a Function; Standard Derivatives; Derivatives of Composite Functions; Properties of Inverse Trigonometric Functions; Rules of Differentiation; Some Other Functions; Higher Order Derivatives; Differential Equations; Application of Differential Equations: Problems on Growth and Decay

Partial and Successive Differentiation Marks: 17

The Difference between Partial Differentiation and Ordinary Differentiation; Partial Differentiation; Rules of Partial Differentiation; Higher Order Partial Derivatives; Successive Differentiation; Euler's Theorem

Mean Value Theorem Marks: 16

Introduction; Rolle's Theorem; Mean Value Theorem; Some Important Facts Related to Mean Value Theorem

Extreme Values of Function of Two Variables & its Application Marks: 15

Extrema; Applied Maximum and Minimum Problems

Reference Books:

1. http://www.colorado.edu/engineering/cas/courses.d/IFEM.d/IFEM.AppC.d/IFEM.AppC.pdf. Last accessed on 20 December, 2010.
2. http://www.numbertheory.org/book/cha4.pdf. Last accessed on 20 December, 2010.
3. http://www.tutorvista.com/content/math/discrete-math/matrices-and-determinants/matrices-and-determinantsindex.php. Last accessed on 20 December, 2010.
4. http://www.numbertheory.org/book/cha6.pdf. Last accessed on 21 December, 2010.

5. http://www.sosmath.com/matrix/eigen0/eigen0.html. Last accessed on 21 December, 2010

0202151: INTRODUCTION TO DIGITAL ELECTRONICS

Full Marks: 100

Digital Electronic Signals and Switches Marks: 17

Introduction; Digital Signal and Logic Levels; Semiconductor Devices: Semiconductor Diode, P-N Junction Characteristics; Switching Characteristics of Semiconductor Diode; Transistors: n-p-n and p-n-p Bipolar Junction Transistor, FET, MOSFET, JFET; Switches: Diodes, BJT Switch, MOSFETs

Number System and Codes Marks: 20

Introduction; Binary System: Binary to Decimal Conversion; Decimal to Binary Conversion; Octal Number System: Octal to Decimal Conversion, Decimal to Octal Conversion, Octal to Binary Conversion, Binary to Octal Conversion; Hexadecimal Number System: Hex to Decimal Conversion, Decimal to Hex Conversion, Hex to Binary Conversion, Binary to Hex Conversion, Hex to Octal Conversion, Octal to Hex Conversion; Codes: BCD Code, ASCII Code, Code Gray, Excess 3; Binary Arithmetic: Addition, Addition of Signed Numbers, Subtraction, Multiplication, Division

Logic Gates and Boolean Algebra Marks: 17

Introduction; Logic Gates: NOT Gate, OR Gate, AND Gate, NAND Gate, NOR Gate, XOR Gate, XNOR; Boolean Algebra: Fundamental Laws, DeMorgan's Theorems, Boolean Identities; Logic Minimization: Karnaugh Maps (K-Maps), Sum-of-Products Equations and Logic Circuits (SOP), Product of Sums (POS), Drawing Karnaugh Maps, Don't Care Conditions, Quine - McCluskey Method

Combinational Logic Design Using MSI Circuit Marks: 16

Introduction; Multiplexing and Demultiplexing: Implementation using MUX; Adder: Binary, Full, Half; Binary Subtractor: 2's Complement Adder and Subtractor, 1's Complement Adder and Subtractor; Decoders and Encoders: Differences in Decoder and Multiplexer; Code Converters: BCD-binary Conversion, Binary-Grey Conversion

Flip-Flops Marks: 16

Introduction; Flip-Flops: Simple Latch or S-R Flip-Flop (Set-Reset Flip-Flop), Forbidden S-R FF Inputs, S-R FF Uses; JK-type Flip Flops; Clocked Circuits: Clocked FF, Clocked R-S FF; D Flip-Flop; "Master-Slave" or Delay Flip-Flops: The Master-Slave D Flip-Flop, The J-K Master-Slave Flip-Flop, The Toggle Flip-Flop (T type); Excitation tables; Shift Registers; Counters

Digital Logic Families Marks: 14

Introduction; Classification of Digital ICs; Characteristics: Fan-in, Fan-out, Propagation Delays, Noise Margin/Immunity, Power Dissipation; Logic Families; Types of Logic Family: (RTL), (DL), (DTL), (ECL), (TTL), (CMOS) LOGIC, CMOS NOT Gate, CMOS NOR Gate, CMOS NAND Gate, Comparison between Important Logic Families

Reference Books:

1. Cavanagh, J., *Sequential Logic: Analysis and Synthesis*. Publisher: CRC Press; 1st ed. (June 2, 2006).
2. *Digital Logic Gates & Flip Flops* [Paperback]. I. Sinclair. Publisher: Science and Behaviour Books (February 1990).

3. Kaiser, C.J., *The Transistor Handbook*. Publisher: Cj Pub; 1st ed. (October 29, 1999).
4. Kanaan Kano. *Semiconductor Devices*. Publisher: Prentice Hall (November 24, 1997).
5. Karris, S. T., *Digital Circuit Analysis and Design with an Introduction to CPLDs and FPGAs*. Publisher: Orchard Publications (November 15, 2005).
6. Li Tan. *Digital Signal Processing: Fundamentals and Applications*. Publisher: Academic Press; 1st ed. (August 9, 2007).
7. M. Morris Mano. *Computer System Architecture* (3rd ed.). Publisher: Prentice Hall; 3rd ed. (October 29, 1992).

0202162: DIGITAL COMPUTER FUNDAMENTALS

Full Marks: 100

Introduction to 8085 Microprocessor Marks: 15

Introduction; Features; Architecture; I/O and Memory Interfacing: I/O Devices and Their Interfacing, IO Addressing, Interfacing of Input Device, Interfacing Output Data; The 8085 Programming Model; The 8085 Addressing Modes; Instruction Set Classification

System Buses Marks: 18

Introduction; Peripheral Component Interconnect (PCI; Features of PCI; Concept of PCI Arbitration: The Arbitration Process, Clock, An Example of Fairness, Bus Parking, Latency, Arbitration Latency, Acquisition Latency, Initial Target Latency, Latency Timer, Bandwidth vs. Latency; Cache Memory Organisations: Fully Associative Mapping, Direct Mapping, Set-associative Mapping, Sector Mapping

Input/Output Modules Marks: 15

Introduction; Functions of I/O Module; Structure; Programmed Input/ Output; Interrupt Driven Input/ Output: Interrupt, Software Poll; Direct Memory Access (DMA)

Operating System Support Marks: 20

Introduction; Types of Operating System: Batch Processing, Time Sharing, Real Time Operating System (RTOS), Multiprogramming Operating System, Multiprocessing System, Networking Operating System, Distributed operating system, Operating Systems for Embedded Devices; Scheduling; Virtual Memory; Memory Management: Relocation, Protection, Sharing, Logical Organisation, Physical Organisation

Central Processing Unit Marks: 15

Introduction; CPU Operation; Processor Organisation: General Register, Addressing Modes; RISC, CISC and VLIW: RISC, VLIW, CISC; Instruction Set: Code Density, Number of Operands

Introduction to Multiprocessor System Marks: 17

Introduction; Flynn's Classification; Characteristics of Multiprocessors: Interprocessor Arbitration, Inter Processor Communication and Synchronisation, Cache Coherence; Parallel Processing; Types of Parallel Organisation; Pipelining

Reference Books:

1. Kifer, M., Smolka, S., 2007, Introduction to Operating System Design and Implementation, Springer, 1st ed.

2. Liu, Y. and Gibson, G. A., 2003, Microcomputer systems 8086/8088 family, Architecture, Programming and Design , 2nd ed., Prentice Hall of India.
3. Patterson, D., A., 2008, Computer Organization and Design, Fourth Edition: The Hardware/Software Interface,
4. Ray, A. K. and Bhurchandi, K.M., Advanced Microprocessor and Peripherals, Tata McGraw Hill.
5. Sarkar, N., Tools for Teaching Computer Networking And Hardware Concepts, Information Science Publishing.
6. Stenerson, J., Programmable Logic Controllers with Control Logix, Delmar Cengage Learning, 1st ed.
7. Stuart, B., 2008, Principles of Operating Systems: Design and Applications, Course Technology, 1st ed.
8. Warford, J. S., Computer Systems, Jones & Bartlett publisher, 4th ed.
9. White, R., 2007, How Computers Work, Que

0202161: INTRODUCTION TO C PROGRAMMING

Full Marks: 100

'C' Fundamentals Marks: 18

Introduction: Operating System, Application Software, Programming Languages, Advanced Development Tools, Web Based Tools; Introduction to 'C': Low Level Languages, High Level Languages; Identifier and Keywords; Data Types and Constants: Basic Data Types, Type Qualifiers, Short, Long, Unsigned, Unsigned long; Variables: Variable Declaration, Variable Initialisation, Declaring Variables as Constants; Operators and Expressions: Arithmetic Operators, Rational Operators, Logical Operators, Comma Operator, Conditional Operators, Bitwise Operators, Assignment Operators, Increment and Decrement Operators; Preprocessor Directives: Macro Expansion, File Inclusion

Data Input and Output Marks: 12

Introduction; getchar Functions; putchar Function; scanf( ) Function; printf( ) Function; gets ( ) and puts ( ) Functions

Control Statements Marks: 17

Introduction; Loops: for Loop Statement, Execution of 'for' Statement, while Loop, do – while statement; The break Statement; continue Statement; 'if' Statement; 'if else' Statement; switch Statement; 'if else if ladder'; Nested if; Iteration Statement; Nested for; goto Statement: Conditional goto, Unconditional goto

Arrays and Strings Marks: 17

Introduction; Declaration of An Array; Initialisation; Dimensions: Single Dimensional Arrays, Declaration of Single Dimensional Arrays, Initialisation of One Dimensional Array, Two Dimensional Arrays, Elements of Multidimensional Array, Initialisation of Multidimensional Array; Strings: String Functions; Passing Array to Functions

Functions and Structures Marks: 20

Introduction to Functions; Uses; Elements of User Defined Functions: Function Declaration, Function Call, Call by Value, Call by Reference, Function Definition; Scope and Lifetime of Variables: Automatic Variables, External Variables, External Declaration, Static Variables, Register Variables; Return Values; Function Categories: Functions with No Arguments and No Return Values, Functions with Arguments and No Return Values, Functions with No Arguments and Return Values, Functions with Arguments and Returning Values; Recursion; Introduction to Structure: Declaring of a Structure, Accessing Structure Elements, Process of Storing Structure Elements; Array of Structures; Additional Features of Structures; Uses of Structures; Unions

Pointers Marks: 16

Introduction; Pointer Declaration; Reference Operator; Dereference Operator; Pointer Arithmetic: Increment (++) , Decrement (--), Addition (+) and Subtraction (-), Differencing; Pointers with Function: Call by Value, Call by Reference, Callback Functions; Function Pointer Syntax; Initialising Function Pointer; Using Function Pointer; Arrays and Pointer; Pointers with Structures; Pointers on Pointer

Reference Books:

1. Al Kelley, *A Book on C: Programming in C*. 4th ed. Addison-Wesley Professional.
2. Gookin, D., (May 7, 2004). *C For Dummies*. 2nd ed. For Dummies.
3. Gookin, D., (September 3, 2004). *C All-in-One Desk Reference for Dummies*. Wiley Publishing, Inc. 2nd ed.
4. Roberts, E. S., (September 10, 1994). *The Art and Science of C: A Library Based Introduction to Computer Science*. 1st ed. Addison Wesley.
5. Glassborow, F., (March 1, 2004). *You can do it: A Beginners Introduction to Computer Programming*. Wiley Publishers.
6. Lecky-Thompson, G. W., (November 12, 2007). *Just Enough C/C++ Programming*. 1st ed. Course Technology PTR.
7. Schildt, H., (April 26, 2000). *C: The Complete Reference*. 4th ed. McGraw-Hill Osborne Media.