

M.Tech. (Computer Science/Software Engineering/Information Technology/VLSI Design)

Section A : Logical Reasoning

Duration : 2 hrs.

Section B : Mathematics

Section C : Computer Fundamentals

**Section D : Computer Sc. (for CS/SE/IT)
Electronics (for VLSI)**

Note : - (i) 1/4 Marks will be deducted for each wrong answer.

(ii) Each candidate has to score 40% in each section and 50% in aggregate to be considered for merit.

Section A – Logical Reasoning

Section B –Mathematics

Algebra: Permutation and Combination, Application of Binomial Theorem. Exponential and Logarithmic Series.

Trigonometric problems on heights and distance, Complex numbers and their properties.

Coordinate Geometry: Strength Line, Circle, Ellipse, Parabola and Hyperbola.

Vectors and Matrice: Vectors, Matrices and Determinants with their basic properties and operations, Eigan values.

Calculus: Successive differentiation, Leibnitz Theorem, Empoison of Functions, Definite integration. Differential equations of first order and first degree. Partial diffentiation, maxima and minima, Linear programming (Similar method, Big-M and two phase methods).

Transformation: Laplace and Fourier Transforms with their basic properties.

Numerical Methods: Floating point Arithmetic, Solution of Linear and Non-linear equations (Gauss Elimination Matrix Inversion, Bi-section, Regula Falsi and Newton Raphson Methods)

Statistics: Probability, Random Variables, Probability Distributions – Uniform, Normal, Poisson, and Binomial. Measures of Central Tendency, Dispersion and Correlation.

Section C – Computer Fundamentals

Computer Organization and Architecture: Basic concepts of computer organization & Architecture, Data Representation, Number System (Binary Octal, Hexadecimal) Inter conversion and Arithmetic, Boolean Algebra, Combinational & Sequential Circuits. CPU, Memory, Input/ Output Devices.

Microprocessor (Intel 8085) and Assembly Language : Intel-8085 μ p, Introduction Set, Interrupts, DMA, Stacks and Subroutine, Concept of Assembler, Interpreter, Compiler, Linker, Loader.

C-programming Language: Tokens, Language Constructs, Arrays, Structures, Union, Pointer, File handling, Preprocessors, Bit level programming.

Computer Networks: Communication Concepts, Transmission Media, OSI Model, Communication Protocols, ISDN, TCP/IP and Internet Services, WAN Technologies.

Section D – Computer Science for M.Tech. (CS, SE, and IT)

Operating Systems and Basics of UNIX: Services, Multi-programming, Multi-tasking, Time Sharing, Buffering, Spooling, Memory Management, Process Management, Deadlocks.

Basic of UNIX: - File System, Device Queue, Linked lists, Tree, Graph, space Matrix.

Data Structures: Abstract data types, Stack, Queue, Linked lists, Tree, Graph, Sparse matrix.

Algorithms: Complexity Measures, Order Notation, Design Approaches-Recursion, Divide & Conquer, Dynamic Programming, Basic Tracing, Branch and Bound, Greedy Method.

Database Management System: Basic Concepts, Data Models, Normal Forms and Storage & Access Methods, Concurrency Control, SQL.

Discrete Mathematics: Set, Relation, Function, and lattices, Graph Theory, Generating Function, Recurrence Relation and Propositional & Predicate Logic.

Theory of Computation: Finite Automata, Regular Language, Context Free Grammar and Language, Push Down Automata & Turing Machine.

Section D – Electronics for M.Tech. (VLSI)

Semi Conductors: Mobility, conductivity, Intrinsic Semiconductors, Impurities, Charge densities, Diffusion, pn Junction, Rectifiers, V-I Characteristic.

Diodes: Load line, clipping circuits, clamping circuits

Junction Transfer: Current components, transistor as an amplifier, Transistor configuration (CE, CB, CC), transistor hybrid model, h parameters.

Field effect transistors: Junction FET, pinch off voltage, V-I characteristics.

Amplifiers: Classification, frequency response, RC coupled.

Oscillators: Feed back concept- Voltage shunt, current series, current shunt, voltage series, phase shift, RC coupled, crystal oscillators.

Operational Amplifiers: Basic operation, Differential amplifiers, offset voltages-current, Integration and Differentiation, Inverting and non-inverting amplifiers, Active filters, sample and hold circuit.

Sample Questions

Duration : 2 hours

Total Marks : 100

Section A – Logical Reasoning

20

- Q.1 Oxygen is related to Bum in the same way Carbon dioxide is related to –
(a) Bleat (b) howl (c) grunt (d) Bray
- Q.2 Find the next number in the series 1, 2, 6, 24 (----)
(a) 60 (b) 95 (c) 120 (d) 150
- Q.3 If DELHI is coded as 73541 and CALCUTTA as 82589662. How can CALICUT be coded?
(a) 5279431 (b) 5978213 (c) 8251896 (d) 8543691
- Q.4 If the last four letters of the 'CONCENTRATION' are written in reverse order followed by next two in the reverse order and next three in the reverse order and then followed by the first four in the reverse order, counting from the end, which letter be eight in the new arrangement?
(a) N (b) T (c) E (d) R
- Q.5 In a family, a couple has a son and a daughter. The age of father is three times that of his daughter and age of the son is half of his mother. The wife is 9 years younger to her husband and the brother is seven years older than his sister. What is the mother's age?
(a) 40 year (b) 45 year (c) 50 year (d) 60 year

Section B – Mathematics

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- Q.1 If the elements a and b of a group commute and $O(a) = m$, $O(b) = n$ with $(m, n) = 1$, then
(a) $O(ab) = m$ (b) $O(ab) = n$ (c) $O(ab) = mn$ (d) $O(ab) = m/n$
(e) None of these
- Q. 2 The line $3x - 4y + 16 = 0$ and $3x - 4y = 4$ are tangents to the same circle. The radius of the circle is:
(a) 1 (b) 2 (c) 3 (d) 4
- Q. 3 The function $x^5 - 5x^4 + 5x^3 - 1$ is maximum at
(a) $x = 1$ (b) $x = 2$ (c) $x = 3$ (d) $x = 4$
- Q.4 Area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is,
(a) πab (b) $2\pi ab$ (c) $3\pi ab$ (d) $4\pi ab$
- Q. 5 A five-figure number is formed with digits 0, 1, 2, 3, 4 without any repetition. The probability that the number formed is divisible by 4 is–
(a) $3/15$ (b) $5/16$ (c) $7/16$ (d) $9/16$

Section C – Computer Fundamentals for M.Tech. (CS, SE, IT and VLSI) 30

- Q1. Cache memory is connected to microprocessor through–
(a) Front Side Bus (b) Back Side Bus (c) ISA bus (d) PCI bus
- Q2. What will be the carry flag after executing following 8085 assembly code?
MVI A, 05
MVI B, 23
SUB B
(a) 1 (b) 0
(c) What it was previously (d) Compliment of what it was previously
- Q.3 Which of the following operators has right to left associativity in c-programming language?
(a) ! (b) & (c) , (d) ||
- Q.4 What will be the values of i and j, after executing following statements in a C-Program?
#define max (A, B) ((A) > (B) ? (A) : (B))
int i = 0;
int j = 1;
x = max (i+ +, j+ +);
(a) i=1, j=2 (b) i=1, j=3 (c) i=2,j=1 (d) i=2 , j= 3
- Q.5 How many characters per sec (7 bits + 1 parity) can be transmitted over a 2400bps line if the transfer is asynchronous (1 start and 1 stop bit)?
(a) 300 (b) 240 (c) 250 (d) 275

Section D – Computer Science for M.Tech. (CS, SE, and IT) 30

- Q.1 Dynamic Address Translation –
(a) is part of the operating system paging algorithm
(b) is useless when swapping is used
(c) is the hardware necessary to implement paging
(d) storage pages at a specific location on a disk
- Q.2 Match List I with List II
- | List-I | List-II |
|-------------------------|----------|
| x : depth-first search | 1. heap |
| y: breadth first search | 2. queue |

z: sorting

3. stack

(a) x-1, y-2, z-3

(b) x-3, y-1, z-2

(c) x-3, y-2, z-1

(d) x-2, y-3, z-1

Q.3 Which into files are used during the operation of the DBMS?

(a) Query languages and utilities

(b) Data manipulation language and query language

(c) Data dictionary and transaction log

(d) Data dictionary and query language

Q.4 The solution of recurrence relation $a_n = 2 a_{n-1} + 1$ with $a_1 = 7$ is-

(a) $7 \cdot 2^{n-1} + 2^{n-1} - 1$

(b) $7 \cdot 2^{n-1} + 2^{n-1}$

(c) $3 \cdot 2^{n-1} + 2^{n-1} + 1$

(d) $7 \cdot 2^{n-1} - 2^{n-1} - 1$

Q.5 A language is denoted by a regular expression $L = (x)^* (x | yx)$. Which of the following is not a legal string within L?

(a) zx

(b) xyz

(c) x

(d) xyxyx

Section D – Electronics for M.Tech. (VLSI)

30

Q. 1 A DEPLETION TYPE NMOS has $V_p = -5$ Volts given $V_{as} = -2$ volt. As V_{DS} is increased, i_d becomes nearly constant when V_{DS} becomes

(a) 2 volts

(b) 3 volts

(c) 5 volts

(d) 7 volts

(e) 10 volts

Q.2 Transfer characteristic of FET is

(a) $I_D = I_{DSS} (1 - V_{ds}/V_p)^2$

(b) $I_D = (1 - V_{ds}/V_p)^2$

(c) $I_D = V_{ds}/V_p$

(d) $I_{DS} = V_{ds} V_p$

(e) $I_{DS} = V_{ds} I_{DSS}$

Q. 3 7401 is IC of

(a) Digital circuit

(b) Microprocessor

(c) Micro controller

(d) op amp

(e) AS : C

Q.4 In transistor doping of emitter as compared to base is

(a) longer

(b) equal

(c) less

(d) very less

(e) not comparable

Q.5 Ideal operational amplifier has slew rate

(a) 0

(b) ∞

(c) $-\infty$

(d) 1

(e) none