Pokhara University

Faculty of Science and Technology

Central Entrance Examination Curriculum

Master of Science in Computer Science, Master of Computer Engineering, Master of Science in Information System Engineering

Total marks: 150 Qualifying marks: 75 (Paying)/53(Scholarship)

Time: 3 hrs

The questions in the entrance examination are categorized in two sections. These sections include Foundation of Mathematics and Computational Foundation. The **section A - Foundation of Mathematics** covers the mathematical theorems, tools and techniques that are required for basis of master in computer engineering and science. The **section B -Computational foundation** covers computer science knowledge.

Section	Course	Weightage (%)
A	Fundamental of Mathematics	30
B	Computational Foundation	70
	Total	**100**

Section A: Foundation of Mathematics

1. Fundamental of Differential and Integral Calculus and Vector Calculus

Functions, limit, continuity and differentiability of functions, higher order derivatives, Asymptotes, Curvature. Integration and its standard techniques, definite integral and its applications, Ordinary Differential Equations, Double Integral, Vectors and Scalars, resolution of vectors, scalar and vector product of two and more vectors, Curl, Gradient and Divergence of Vectors, Line (Green and Stock Theorem) Integral and Surface (Guess Theorem) Integrals of vectors, Eigen vectors and Eigen value of matrix.

2. Fourier Series, Integral and Transformations

Periodic functions, Fourier series, Even and Odd functions and their Fourier series, half range expansion of Fourier series, Fourier Integral, Fourier Sine and cosine Integral, Fourier Transformation, Fourier Complex Transformation, Inverse Fourier Transformation, Fourier Sine and cosine Transformation and its Applications.

3. Laplace and Z-Transformation

Laplace transform, Integration and derivative of Laplace Transformation, Inverse Laplace transform and Applications of Laplace transform on ODE. One-sided and two-

sided Z-transform, linear time invariant system, Unit impulse function, properties of Z-transform, region of convergence, inverse Z-transform by residue and partial fraction.

4. Introduction and Descriptive Statistics

Presentation and classification data frequency distribution, histogram, pictorial and diagrammatic method, measures of central tendency and location-mean, median, quartiles and percentiles, measures of dispersion (variability) range, quartile deviation, deviation, standard deviation, Probability, Combination and Permutations.

Section B: Computational Foundation

1. Programming Paradigms

C programming:- Procedural programming, structured programming, Object-oriented programming, control structures, function, arrays, pointers, functions, preprocessor directives, C libraries, Macros, Header files and prototyping.

Object-oriented programming:- Classes and Methods, Message, message passing formalization, message passing syntax in C++, mechanism for creation and initialization (constructor and its types), Issues in creation and initialization: memory map, memory allocation methods and memory recovery, Object Inheritance and Reusability, Template and generic programming- template classes, template functions.

2. Data Structure and Algorithm

Abstract data type, Data Structure Concept, Stack, Stack applications, Queue, Linear and circular queue and their application, Double Ended Queue, Priority queue, Link List, Doubly linked lists and its advantages, Implementation of Doubly Linked List, Linked, Implementation of stacks and Queues, Binary tree, Binary search tree, Binary tree traversals, Balanced trees, AVL balanced trees, Balancing algorithm, The Huffman algorithm, Game tree, B- Tree, Searching, Exchange sort, Bubble and quick sort, Merge and Radix sort, Shell sort, Heap sort, Binary search, Hashing, Hash function and hash tables, Collision resolution technique, Graphs, Graphs traversal and spanning forests, Kruskal 's and Round Robin algorithms, Shortest-path algorithm, Greedy algorithm, Dijkstra's Algorithm, Algorithm analysis, Growth of functions- Asymptotic notations, Big O Notation

3. Computer Architecture and Organization (20X1=20)

CPU organization, register organization, Instruction cycle, Computer Arithmetic, Instruction sets, addressing modes, Control Unit- hardwired control Unit, micro-programmed control unit, Cache memory- catch principle, mapping catch memory, write policy, replacement algorithms, Input-output organization- programmed I/O, interrupt driven I/O, Direct memory access, RISC vs. CISC, RISC pipelining, parallel processing- parallelism in uni-processor system, multiprocessor system and their characteristics, Flynn's classification, Cache coherence, vector processing and array processor, multi-core organization, dual core and quad core processors.

4. Operating system and concepts

Operating system concepts and functionalities, operating system structure, process states and transition, process control block (PCB), inter-process communication, critical regions and conditions, mutual exclusion, Dekker's and Peterson's algorithm, Dead lock, dead-lock avoidance, detection and prevention, threads, advantage of threads, process scheduling techniques, paging, segmentation, Distributed operating system- network architecture, Asynchronous Transfer Mode, Client-Server model.

5. Object-oriented Software Engineering

Software process and framework, process models, Agile development, Extreme programming, Scrum, Software modeling, quality management and testing, CMMI.

6. Database Management System

Need of DBMS, concept of DDL, DML and DCL, ER Model, UML class diagram, relational algebra, schema and views, SQL, normalization and normal forms, security.