Data Science
Class XI

Theory – 70
Syllabus , Marks Distribution
and Question Pattern

1. Computer Fundamentals [17 Marks]		
1A	History of computer, Basic Computer hardware, input and output devices, Basic computer architecture, input output devices, memory and CPU, networking of machines (overview of LAN, MAN, WAN, Internet, Wifi etc), types of computer (workstation, desktop, Smartphone, embedded system, etc.), Overview of software (system software and application software with examples (mention names only)), Definition of Operating System and functions (mention names of some popular operating systems like Windows, Linux, Android, etc).	5
1B	Bit, Byte and Word, Number System (Base, Binary, Decimal, Octal, Hexadecimal), Conversion of number systems, Boolean logic (Boolean Gates), Boolean operators (OR, AND and NOT), ASCII code, Concept of Algorithm and Flowchart.	7
1C	Basics of Computer Programming (three levels: high level language, assembly language, machine language, definition and block diagrams), Overview of Compiler and Interpreter (definition and mention name of major compiled (e.g., C, C++) and interpreted languages (e.g., Python)), Overview of procedural and object oriented programming (key features and just the basic differences, mention names of some popular procedural (e.g., BASIC, FORTRAN, C) and object oriented programming languages (e.g., C++, Java, Python)).	5

2. Introduction to Python Programming [15 Marks]		
2A	Basics of Python programming (with a simple 'hello world' program, process of writing a program, running it, and print statement), Concept of class and object, Data-types (integer, float, string), notion of a variable, Operators (assignment, logical, arithmetic etc.), accepting input from console, conditional statements (If else and Nested If else), Collections (List, Tuple, Sets and Dictionary), Loops (For Loop, While Loop & Nested Loops), iterator, String and fundamental string operations (compare, concatenation, sub string etc.), Function, recursion.	7
2B	Overview of linear and nonlinear data structure (definition, schematic view and difference), array (1D, 2D and its relation with matrix, basic operations: access elements using index, insert, delete, search), stack (concept of LIFO, basic operations: Push, Pop, peek, size), queue (concept of FIFO, basic operations: Enqueue, Dequeue, peek, size), useof List methods in python for basic operations on array, stack and queue, overview of NumPy library and basic array operations (arrange(), shape(), ndim(), dtype() etc.), binarytree (definition and schematic view only) .	5
2C	Linear search and binary search algorithm, sorting algorithm (bubble sort only)	3

	3. Foundation for AI and Data Science [15 Marks]	
3A	History of AI: Alan Turing and cracking enigma, mark 1 machines, 1956-the birth of the term AI, AI winter of 70's, expert systems of 1980s, skipped journey of present day AI. Distinction between terms AI, Pattern recognition and Machine Learning Note: should be taught as a story more than flow of information World war 2, Enigma and Alan Turing, the birth of modem computers	3
3B	Brief history of data science, data science as a conjunction of computer science statistics and domain knowledge. Definition of data science, data science life cycle • capture, maintain, process, analyze, communicate	

3C	Introduction to linear algebra and statistics for AI :
	• Basic matrix operations like matrix addition, subtraction, multiplication, transpose of matrix, identity matrix
	• A brief introduction to vectors, unit vector, normal vector, Euclidean space
	   - Probability distribution, frequency, mean, median and mode, variance and standard deviation, Gaussian distribution
	• Correlation , parametric , non-parametric tests
	   - (Basic idea)-
	• Distance function, Euclidean norm, distance between two points in 2D and 3D and extension of idea to n dimensions
		8

3D	Basic ideas of different Data Science Toolkit; Excel, R	4

	4. Data Visualization [10 Marks]	
4	Types of data: textual data (reviews, comments, blogs), signal data (time series, audio, sensor data) visual data (image and video, remote sensing data, feeds etc.) Introduction to data dimension and modality, their representations in computer science. Data cleaning • Representation of data in textual form, tokens, sentences, word histograms, reading from web pages using crawlers • Representation format of audio data, uncompressed wav format and compressed mp3 format (just the description of pipeline , no maths) • Representation of visual data in RGB pixels, storing in raw format and compressed format Gust the description of the pipeline, no maths) • Data dimension (resolution for image, frequency bins and sampling rate for audio, word histograms for text) • Concept of data cleaning, removal of abnormal, incomplete, and corrupted or garbage data as a pre-processing stage	10

5. Database Management [10 Marks]

5	Brief introduction to relational database , Relational Algebra , tables for keeping data , Brief introduction to SQL • Introduction to the concept of database • Relational database , table , schema as columns and tuple as rows • Relational Algebra • Some basic SQL statements such as CREATE , SELECT , INSERT , UPDATE , DELETE (simple query examples)	10

6. Basics of Business Theory [3 Marks]

6	• The basic business types : product based and service based • Business classification by clients , the B2B and B2C models • Types of business who use DS extensively : software product and service , aggregator (cab , food delivery , groceries , online market), manufacturing and banking • Social media business and targeted advertisement based business model	3

QUESTION PATTERN OF DATA SCIENCE
Question Pattern
Class XI

Sl.no.	Unit	MCQ (21 Nos.) (1 mark)	SA (14 Nos.) (1 mark)	Descriptive [7marks- 4+3/5+2/3+2+2/4+2+1/3+3+1]	TOTAL
1.	Computer Fundamentals	5Qx1M=5	5Qx1M=5	1MX7Q=7	17
2.	Introduction to Python Programming	5x1=5	3x1=3	1X7=7	15
3.	Foundation for AI and Data Science	5x1=5	1x3=3	1X7=7	15
4.	Data Visualization	2×1=2	1x1=1	1×7	10
5.	Database Management	2x1=2	1x1=1	1X7=7	10
6.	Basics of Business Theory	2x1=2	1x1=1	-	03
SUMMARY		**21 marks (21Questions)**	**14 marks (14Questions)**	**35 marks**	**Total – 70 marks**