

ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

COMPUTER SCIENCE

Grade XI

NATIONAL CURRICULUM
2022-23



50% MCQs & 50% Descriptive
INCLUSIVE SCHEME OF STUDIES 2024



FEDERAL BOARD OF
INTERMEDIATE AND SECONDARY
EDUCATION, ISLAMABAD

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**FEDERAL BOARD OF INTERMEDIATE AND
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H-8/4, ISLAMABAD



**ASSESSMENT FRAMEWORK
FOR
COMPUTER SCIENCE GRADE-XI
CURRICULUM 2022-23
SCHEME OF STUDIES 2024**

ACKNOWLEDGEMENT

It is a great honour that we, at the Federal Board of Intermediate and Secondary Education, have developed the Assessment Framework (AF) for the subject of Computer Science for Grade-XI. The primary objective of the AF is to optimize the current curriculum 2022-23. This comprehensive framework has been crafted meticulously by subject matter and assessment experts who conducted an in-depth review of all learning outcomes for Grade-XI Computer Science curriculum. They evaluated these outcomes in terms of their scope, cognitive level, and progression across the grade.

This significant undertaking was the result of a series of extensive meetings and collaborative efforts of the subject and assessment experts. Their dedication and expertise have been instrumental in bringing this framework to fruition.

The Assessment Framework will serve as a guiding document for students, teachers and paper setters. Students will receive clear directions for preparing themselves for the annual examination. Similarly, teachers will use it as a guide to understand what to teach in class and to prepare students for the final examinations accordingly. Similarly paper setters will also seek guidance from this document.

Following subject as well as assessment experts/committee members remained constantly engaged in the development of the AF:

1. Ms. Rozina Faheem, Principal, FG College of Home economic and Management Sciences, F-11/1 IBD
2. Ms. Sadaf Zehra, Associate Professor, Islamabad Model College for Girls, F-7/2, Islamabad
3. Ms. Sadia Mujtaba, Assistant Professor, Islamabad Model College for Girls, I-8/4 Islamabad
4. Dr. Saghir Ahmad, Lecturer, Islamabad Model College for Girls, F-6/2, Islamabad
5. Dr. Nauman Zahid, Subject Experts, APSAC Secretariat Rawalpindi

The whole work was successfully accomplished under the able supervision and guidance of Dr. Ikram Ali Malik, Chairman, FBISE and due to the hard work and dedication of the staff of Research Section of FBISE, in particular, Syed Zulfiqar Shah, Deputy Secretary, Research and Academics who played a pivotal and leading role in finalizing the Assessment Framework.

MIRZA ALI
Director
FBISE, Islamabad

ASSESSMENT FRAMEWORK FOR COMPUTER SCIENCE GRADE-XI, CURRICULUM 2022-23

To ensure clarity and precision in assessment, the learning outcomes have been categorized into two distinct groups: formative and summative. This classification helps in effectively measuring student progress and understanding. Each Student learning outcome (SLO) has been carefully marked as either formative or summative within the newly developed Assessment Framework. SLOs of Summative Assessment Format will be part of the Final Examination while SLOs of Formative Assessment will although be part of the teaching-learning activity but they will **NOT** be part of Final Examinations. Estimated cognitive levels i.e Knowledge (K), Understanding (U) and Application (A) of all the SLOs have also been indicated. It may be noted that all the higher cognitive levels have been collectively accumulated in the cognitive level of 'Application'. In subjects involving Practicals (Lab work), it has been mentioned categorically whether an SLO is summative for theory or summative for Practical Based Assessment (PBA). If an SLO is summative for PBA, it means that Laboratory work is required in the teaching-learning activity and it will be part of the Practical Examination/ Practical Based Assessment.

The Assessment Framework will act as a comprehensive guide for students, teachers and paper setters. Students will have clear instructions on how to prepare for the annual examinations. Teachers will use the framework to understand the curriculum and effectively prepare their students for the final examination. Additionally, paper setters will refer to this document for guidance in setting examination papers.

A model question paper has also been developed to provide a clear structure and format for upcoming examinations. The model question paper ensures consistency and fairness, offering students a comprehensive understanding of what to expect in their examinations. By aligning the paper with the Student Learning Outcomes (SLOs) of the curriculum, we ensured that the questions accurately reflect the skills and knowledge that students are expected to acquire.

A detailed Table of Specifications (ToS) has been created to ensure equitable coverage of cognitive levels and content domains in order to generate a balanced question paper. The ToS serves as drawing scale and action plan for the question paper, ensuring that all important areas of the curriculum are adequately and proportionately assessed.

FORMATIVE ASSESSMENT: AN ESSENTIAL COMPONENT OF EFFECTIVE LEARNING

Formative assessment is a pivotal element in the educational process, distinguished by its role in providing ongoing feedback to both students and educators. Unlike summative assessments, which evaluate student learning at the end of an instructional period, formative assessments are integrated into the learning process to monitor student understanding and guide instructional decisions.

The primary objective of formative assessment is to identify learning gaps and misunderstandings as they occur, enabling timely interventions. This dynamic approach allows teachers to adjust their teaching strategies to better meet the needs of their students. For instance, if a teacher notices through a quick quiz or class discussion that a significant portion of the class struggles with a particular concept, they can revisit that topic, providing additional explanations or alternative methods of instruction. This adaptability is crucial for fostering a deeper understanding of the material.

Formative assessments come in various forms, ranging from informal methods like classroom discussions, observations, and questioning, to more structured approaches such as quizzes, peer assessments, and self-reflections. These methods are not limited to paper-and-pencil tasks but can include digital tools that provide instant feedback. The versatility of formative assessments allows educators to cater to diverse learning styles and preferences, ensuring that all students are engaged and supported in their learning journey.

Formative assessment plays a significant role in creating a supportive classroom environment. It shifts the focus from merely achieving grades to understanding the learning process. This approach reduces the pressure on students, as they perceive assessments not as a final judgment of their abilities but as a part of their learning journey. Consequently, formative assessment can lead to increased student motivation and engagement.

In conclusion, formative assessment is a powerful tool that, when effectively implemented, can significantly enhance the learning experience. It provides invaluable insights for both teachers and students, promotes a growth-oriented learning environment, and supports the continuous development of essential skills. As education evolves, the role of formative assessment will undoubtedly continue to be central in fostering successful and meaningful learning experiences.

SUMMATIVE ASSESSMENT: EVALUATING LEARNING OUTCOMES IN THE FORM OF TERMINAL/FINAL EXAMINATION

Summative assessment is a fundamental component of the educational process, designed to evaluate student learning at the conclusion of an instructional period. Unlike formative assessment, which provides ongoing feedback during the learning process, summative assessment serves as a final measure of what students have learned. Typically administered at the end of a unit, course, or academic year. Summative assessment aims to determine the extent to which educational objectives have been achieved.

The primary purpose of summative assessment is to assess the overall effectiveness of instruction and learning. It provides a conclusive evaluation of student performance, often in the form of tests, final projects, or standardized exams. These assessments generate grades or scores that reflect a student's achievement in a given subject area over a specific period or time duration.

Summative assessment is often used to make critical decisions regarding student progression, certification, or placement in subsequent educational levels. Additionally, summative assessments provide valuable data that inform curriculum development and instructional strategies. By analyzing summative assessment results, educators can identify trends, strengths, and weaknesses within their instructional approaches, allowing for improvements in future teaching.

In conclusion, summative assessment plays a critical role in the educational process by providing a final evaluation of student learning. While it differs from formative assessment in its focus and application, it is an essential tool for measuring academic achievement. When balanced with formative assessments, summative assessments contribute to a well-rounded and effective approach to evaluating and supporting student learning.

National Curriculum of Pakistan 2022-23
Assessment Framework
COMPUTER SCIENCE Grade-XI (HSSC-I)
Details of Content Areas/ SLOs

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
A: Computer Systems	[SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams. Students will understand... • Boolean functions • Boolean expressions • Boolean identities • Duality • What is digital logic • What makes analog and digital signals different • What are logic gates • What are truth tables • What are switches Students will be able to • Construct Boolean functions, expressions, and identities. • Recognize duality • Identify different logic gates and explain their uses • Create truth tables for expressions up to 3 inputs • Draw logic gates for a Boolean expression • Draw a truth table for a logic gate to identify the outputs	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	30

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	Student will know • Key terms: Karnaugh maps, AND, OR, NOT, NAND gates, XOR • How to create truth tables • How to identify logic gates and understand their usage				
	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies. Students will understand that • What is a Software Development Life Cycle(SDLC) ○ What are the different activities involved in each phase of the SDLC • (Advanced) What are basic software processes and Agile, Water fall software process models Students will know • Key terms: SDLC, bug, Agile, Waterfall, debugging, testing, design patterns, UML. • Key activities in software development and the role of software development processes • The engineering nature of software development • Key concepts in software development such as risk and quality Students will be able to • Relate the different stages of SDLC(analysis, design, coding, testing etc.) to a case study • Plan a software project from beginning (design) to end(test and launch) • (Advanced)Explain common software development processes(agile etc.)	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	Explain black box and white box testing				
	[SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems via network topology Students will understand... - Different types of network topologies - Design, common access, and use of topologies - Scalability and reliability - Preparing for scale and reliability through load and system testing - Scalability and reliability in cloud computing Students will know - Key terms: Network topology, Bus, Ring, Tree, Star, Mesh, Hybrid, Ethernet, CSMA, Token passing, client, Server, root, node... - Advantages and disadvantages of each network topology Students will be able to - Measure availability of a system - Prepare systems so they run with high reliability and can scale well - Test the scalability and reliability of a system	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	
	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data. Students will understand... - Cybersecurity - Encryption - Ways a system can be attacked - Basic security frameworks - Security analysis and proactive protection of systems against cyberattacks	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	- Data policies and privacy policies and how they can help keep your information safe Students will know - Key terms: Cryptography, 2FA, firewall, DDoS, Hacking, Authentication, Authorization, Hashing, Malware, Phishing, XSS, Plaintext, Ciphertext, Encryption, Decryption.... Students will be able to - Protect their computers and setup online access taking into account the security risks they are prone to - Understand how basic cyberattacks are constructed and applies to real systems - Analyze cyber security risk and create a plan to prioritize risk decisions - Understand basic encryption techniques and algorithms used to protect sensitive data - How to protect sensitive apps and data through strong passwords, 2 factor authentication and encryption techniques.				
B: Computational Thinking and Algorithms	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc. Students will understand - How to use different methods to design and construct a solution to a computational problem Students will be able to - Create pseudocode to address computational problems in the correct font, size, style, indentation, case, line numbers, comments, data type keywords, variable assignments & declarations, common operators, and key commands	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	20

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	- Systematically test computational artifacts - Analyse an algorithm presented as a flow chart in terms of include tracing an algorithm as well as assessing its correctness. - Evaluate algorithms in terms of their efficiency, correctness, and clarity				
	[SLO CS-11-B-02]Apply common search, and sort algorithms Students will understand - Problem solving methods using simple example of - Abstraction - Decomposition - Pattern recognition - Algorithmic approaches to solve practical exercises of algorithms - When to use various search and sort algorithms such as linear search, binary search, insertion sort, bubble sort, etc. Students will be able to - Use and adapt classic algorithms to solve computational problems (e.g. sorting and searching algorithms such as linear search, binary search, insertion sort, bubble sort, etc.)	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	
C: Program ming Fundamentals	[SLO CS-11-C-01] Students should understand the importance of computer programming and applications Students will understand... - Programs use the basic components of a computer to take inputs, process the input, and produce output - The Agile and Waterfall are models of the Software Development Life cycle and are used to gather requirements and implement software	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	40

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	Students will be able to... Take a real-world problem, propose a software solution, and implement it.				
	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python. Students will understand... - What is Python, why is it used - What type of problems can be solved using Python - Input/Output handling - Variables in Python - Operators in Python - Sequence, Selection, Repetition in Python Students will be able to... - Write and execute a program in Python using an IDE like replit.com (online) VS Code(offline) that uses variables, sequence, selection, and repetition	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	
	[SLO CS-11-C-03] Students should be able to draw shapes using Turtle Graphics functions in Python Students will understand... - How to use the Python Turtle Library - Turtle methods - Methods of screen - Turtle motion - Use of events - Create/draw shapes - Compound Shapes	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	- How to create shapes by means of instructions to a “turtle” to move in a given direction - How to create more complex shapes by allowing the “turtle” to lift the pen while moving Students will be able to... - Write and execute a program in Python to create complex shapes using the Turtle library				
	[SLO CS-11-C-04]Students should be able to understand the need for libraries and learn the use of some simple libraries in Python. Students will understand... - The concept of abstraction allows the use of complex libraries without knowing their internal implementation Students will be able to... - Find and use a third-party Python library that is simple to use but has a complex implementation	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	
	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python. Students will understand... - What are variables, sequence, repetition, and lists in Python - How to use sequence and repetition to manipulate lists in Python Students will be able to... - Write and execute a Python program that uses variables, sequence, and repetition to populate a list - Write and execute a Python program that uses variables, sequence, and repetition to find an element in a list	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	
	[SLO CS-11-C-06] Students should be able to decompose a problem into	Summative	Knowledge /	Question(s) will be	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	sub-problems and implement those sub-problems using functions in Python Students will understand... • Why we need functions • How to decompose a large problem into sub-problems • How to identify duplication in their code • How to move duplicated code into a function • How to create/define/invoke a function • Types of Functions • Function parameters/arguments • Scope of variables • Returning value from a function • Pass by value Students will be able to... • Write and execute a Python program that solves a large problem by decomposing into subproblems • Write a Python program that invokes functions within loops • Write a Python program that performs some mathematical operation on a value passed to it, and returns the updated value (for example Celsius to Fahrenheit conversion etc.)	for Theory and Practical Based Assessment	Understanding/ Application	asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	
	[SLO CS-11-C-07] Students will determine ways of debugging their code in Python Students will understand... • Code written outside of a function is hard to test • Code written inside a function can be tested • That they can write code that calls functions to ensure the results are correct	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	- Using a debugger allows programmers to set a breakpoint to stop execution of their code to see the state of variables mid-execution for the purpose of discovering errors in their code Students will be able to... - Write code to invoke functions and check their return values for correctness - Read through code and dry run by hand to find bugs				
D: Data and Analysis	[SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications Students will know how statistical modeling can find relationships between real world events and can be used to make recommendations based on statistical findings. They will know use cases for modeling, when they can be used, which models fit which use cases and basic statistical techniques such as linear regression and multiple linear regression. Students will know: - The linear relationship between variables (using correlation coefficients and build the $y = mx + c$ using slope and intercept) - The structure of linear models, K-means, Smoothing Students will be able to: - Use the information from one variable to make predictions about another variable (fitting a line to understand the relationship between two variables and use the correlation coefficient to assess the linear association) - Identify the slope and intercept for the linear relationship - Build their first statistical model (Microsoft Excel Python, Weka, or Microsoft Excel)	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	25

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	(Advanced) Interpret the results of the model including statistical significance and beta values (Advanced) Draw conclusions from the model output to inform real world policies				
	[SLO CS-11-D-02] Students will understand and explain experimental design in data science Students will understand - The importance of experimentation in data science as a tool to differentiate between correlation and causation - Measures used in experimentation - Real work experimentation examples Student will know... - Data collection methods, including traditional methods of designed experiments and observational studies and surveys - Statistics as a process for making inferences about population parameters based on a random sample from that population Students will be able to - Differentiate between correlation and causation - Compare and contrast population vs. sample - Compare and contrast parameter vs. statistic - How to do their own experiments through in-class activities - Apply a real-world business problem where experimentation is used.(e.g. Facebook, YouTube, on line retail) - Explain situations where one measure of central tendency or spread may be more appropriate than others (Advanced) Identify reports that use special data structures (census, survey, observational study, and randomized experiment)	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	• (Advanced) Use RStudio/python to re-randomize data • (Advanced) Compute measures of central tendency and spread in RStudio/python				
	[SLO CS-11-D-03] Students will analyze pre-existing data sets to create summary statistics and data visuals (such as bar charts, pie charts, line graphs, etc.) Students will understand • Definitions and analysis of data and data products (charts, graphs, statistics) • How to construct multiple views of data • How to use analyze data through computational tools such as Excel, Google Sheets, R, or Python Students will • Apply their knowledge of visualization techniques (such as measures of center and spread, boxplots, bar plots , histograms, scatterplots) to data • Read plots (identify the name of the plot, interpret the axes, look for trends, identify confounding factors) • Use visualization to tell stories with data • (Advanced) Create basic plots in RStudio • (Advanced) Create frequency tables in RStudio • (Advanced) Critically read reports from media sources to evaluate their claims and communicate their evaluations in written or verbal form using different types of media Students will be able to... • Collect, clean, and manipulate data using tools such as Excel, Google Sheets, R, or Python	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	- Analyze data using statistical techniques and create visualizations to communicate their findings - Understand the connection of databases to machine learning (Advanced) Understand how evidence was collected, what the perspective or bias of the creator might be and look behind the scenes to the process used to create the product. Even the way data are represented embeds within it decisions on the part of the data creator				
E: Applications of Computer Science	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain Students will understand... - Advancement in technologies like smaller size, higher processing power, longer battery power, AI techniques, cloud computing, and connectivity have enabled IoT applications - Network connectivity, Processing power, and Cryptography are technologies that enable blockchains Students will be able to... - Analyze technologies that have enabled IoT and blockchain applications	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	15
	[SLO CS-11-E-02] Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs Students will understand... - That there are different stakeholders that have vested interest in the outcomes of an AI algorithm - These different stakeholders might have conflicting requirements for	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	these algorithms Students will be able to... - Explore some of the stakeholders and describe their interest in AI algorithms - Assess policies that can help protect different stakeholders' interests - Evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs				
F: Impacts of Computing	[SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its sources Students will understand... - Safe & responsible use of information sources - Human bias is everywhere including data collection and information sharing Students will know... - The difference between data source verification tasks that should be completed by humans and those that are ideally completed by computing devices Students will be able to... - Identify sources of reliable and unreliable information - Address issues of bias in the designs of their computing applications - Conduct data searches to obtain reliable information	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	15
	[SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity Students will understand... The uses of assistive technologies for people with disabilities and the	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	elderly - The impact of the digital divide on connectivity and how accessibility to information affects the lives of different people Students will know... - The different technological innovations we are using to improve communication between people such as Wi-Fi networks, Bluetooth etc. Students will be able to... - Discuss the impact of computing technology on business and commerce - Collaborate on strategies to provide equity and equal access to information (Advanced) Distinguish between impact of tasks that are ideally completed by humans and those that are ideally completed by computing devices				
G: Digital Literacy	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) Students will understand... - Definitions of data collection strategies (e.g. qualitative interviews, surveys, prototypes, simulations) - Best practices on how to present primary & secondary data for a research question - How to design data-collection approach to gather original data Students will know... - How to use appropriate data collection strategies for various types of research questions	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	10

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	Students will be able to... • Design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) • Present data using appropriate digital tools (such as graphs or infographics in worksheets, presentations, reports etc.)				
H: Entrepreneurship in the digital age	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea Students will understand... • What is prototyping and why is it important • How to design and test a prototype Students will be able to... • Design, build and test the prototype • Derive learnings from prototype testing • Iterate business solution based on prototype test results	Summative for Theory and Practical Based Assessment	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment	10

Note: PBA STANDS FOR “PRACTICAL BASED ASSESSMENT”

FINAL CONCEPTUAL PATTERN OF HSSC-I & II

Physics, Chemistry, Biology and Computer Science

Total Marks: 80 Marks (Theory Paper)

Components	Detail
Marks Allocated to MCQs	40 marks
Total MCQs	80
Marks per MCQ	0.5
Objective Portion – MCQs (40 Marks)	Section-A (MCQs) 56 straight MCQs ($56 \times 0.5 = 28$ marks) 24 MCQs with (6-stimulus/situations/scenario) ($24 \times 0.5 = 12$ marks)
Subjective Portion – SRQs & ERQs Structure (40 Marks)	Section-B (SRQs) Section B having 7 questions. Each question has internal choice. Each question having 4 marks. ($7 \times 4 = 28$ marks) Section –C (ERQs) Section C having 2 questions. Each question has internal choice. Each question having 6 marks. ($2 \times 6 = 12$ marks)
Subjective Portion Structure	7 straight SRQs (with no sub parts) 2 straight ERQs (may having parts but with same concept)

Important Note:

- i) Summative SLOs of NCP Computer Science 2022-23 for grades XI or XII will only be included.
- ii) Ensure balanced domain coverage using the Table of Specifications (ToS).

Total Marks: 40
Time Allowed: 1:40 Hours

Phy/Chem/Bio/CSC HSSC-1

To be filled-in by the Candidate

MCQs PAPER VERSION

A	B	C	D	E
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CORRECTLY FILLED



WRONG METHOD



Question Booklet No.

Roll Number					

FILL ONLY ONE BUBBLE FOR EACH CORRECT ANSWER. USE BLACK BALL POINT/MARKER

FOLLOW THE CORRECT SEQUENCE TO FILL-IN THE BUBBLES

1	A	B	C	D	12	A	B	C	D	23	A	B	C	D	34	A	B	C	D	45	A	B	C	D
2	A	B	C	D	16	A	B	C	D	24	A	B	C	D	35	A	B	C	D	46	A	B	C	D
3	A	B	C	D	14	A	B	C	D	25	A	B	C	D	36	A	B	C	D	47	A	B	C	D
4	A	B	C	D	15	A	B	C	D	26	A	B	C	D	37	A	B	C	D	48	A	B	C	D
5	A	B	C	D	16	A	B	C	D	27	A	B	C	D	38	A	B	C	D	49	A	B	C	D
6	A	B	C	D	17	A	B	C	D	28	A	B	C	D	39	A	B	C	D	50	A	B	C	D
7	A	B	C	D	18	A	B	C	D	29	A	B	C	D	40	A	B	C	D	51	A	B	C	D
8	A	B	C	D	19	A	B	C	D	30	A	B	C	D	41	A	B	C	D	52	A	B	C	D
9	A	B	C	D	20	A	B	C	D	31	A	B	C	D	42	A	B	C	D	53	A	B	C	D
10	A	B	C	D	21	A	B	C	D	32	A	B	C	D	43	A	B	C	D	54	A	B	C	D
11	A	B	C	D	22	A	B	C	D	33	A	B	C	D	44	A	B	C	D	55	A	B	C	D
																			56	A	B	C	D	

FOLLOW THE CORRECT SEQUENCE TO FILL-IN THE BUBBLES (SCENARIO BASED MCQs)	57	A	B	C	D	61	A	B	C	D	65	A	B	C	D
	58	A	B	C	D	62	A	B	C	D	66	A	B	C	D
	59	A	B	C	D	63	A	B	C	D	67	A	B	C	D
	60	A	B	C	D	64	A	B	C	D	68	A	B	C	D
FOLLOW THE CORRECT SEQUENCE TO FILL-IN THE BUBBLES (SCENARIO BASED MCQs)	69	A	B	C	D	73	A	B	C	D	77	A	B	C	D
	70	A	B	C	D	74	A	B	C	D	78	A	B	C	D
	71	A	B	C	D	75	A	B	C	D	79	A	B	C	D
	72	A	B	C	D	76	A	B	C	D	80	A	B	C	D



Federal Board HSSC-I Examination
Computer Science Model Question Paper
National Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)
(50% MCQs & 50% Descriptive)

SECTION - A (Marks 40)

Time Allowed: 1:40 hours

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

ROLL NUMBER					

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2	2	2	2	2	2
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4	4	4	4	4	4
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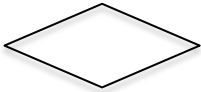
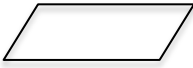
Candidate Sign. _____

Invigilator Sign. _____

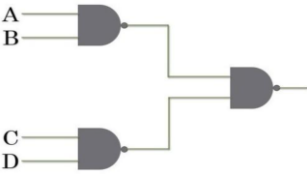
Note: Fill the correct bubble for each question. Each question carries 0.5 mark.

S #	Question	(A)	(B)	(C)	(D)
1.	Which of the following is an example of a computational artifact?	Mobile Applications	A physical book	A Calculator	A printed photograph
2.	Which cloud deployment model offers the highest level of data security?	Public cloud	Private cloud	Community cloud	Consortium cloud
3.	Which type of blockchain network is open for anyone to join without permission?	Public blockchain	Private blockchain	Hybrid blockchain	Consortium blockchain
4.	Which of the following is an example of Software as a Service (SaaS)?	Virtual machine on AWS	Microsoft Word installed locally	Gmail service	Load balancer for servers
5.	Which type of malware spreads automatically across networks without needing user interaction?	Virus	Trojan	Ransomware	Worm
6.	What is the purpose of tracing an algorithm?	To test its correctness	To write a new program	TO add more steps	To delete unnecessary steps
7.	Which symbol is used to start a single-line comment in Python?	//	/* */	--	#
8.	What is the term for data collected from every member of a defined group?	Sample	Variable	Population	Parameter
9.	What does a computer system in hospitals mainly store?	Only CCTV videos	Patient records and medical data	Only In-door patients information	Only pathology reports

10.	What is the main goal of cybersecurity?	To detect and remove viruses from a system only	Protect systems and data from cyberattacks	To monitor employee internet usage within an organization	To recover lost data after a system failure
11.	What is the correct syntax of a while loop in Python?	While (condition)	while condition then:	while {condition}	while condition:
12.	Which command is used to create a Turtle Graphics screen in Python?	turtle.Screen()	turtle.screen()	turtle.create_screen()	turtle.show_screen()
13.	In Python, how many values can a single return statement send back directly?	Only one value	Exactly two values	Exactly three values	Multiple values (as a tuple)
14.	Which of the following keyword is used to define a function in Python?	function	define	def	func
15.	Clustering algorithms are primarily used in which branch of machine learning?	Classical learning	Professional learning	Supervised Learning	unsupervised learning
16.	An experimental design is a tool primarily used to:	Evaluate the effect of variables under controlled conditions	Develop procedures for collecting and measuring data consistently	Identify relationships and patterns within an existing dataset	Summarize research findings for presentation and reporting
17.	What is the main purpose of a Minimum Viable Product (MVP)?	To include as many features as possible	To test advertisements	To solve the core user problem with basic features	to launch a final version of product
18.	A block of code that can be reused to perform a specific task is called?	constant	variable	function	list
19.	Which of the following is a characteristic of a digital signal?	It can take any value within a range	It varies continuously over time	It represents information using distinct levels, such as 0 and 1	It is always transmitted as sound waves
20.	Which sorting algorithm repeatedly compares adjacent elements and swaps them if necessary?	Bubble Sort	Quick Sort	Merge Sort	Selection Sort
21.	Which pseudocode statement assigns the value 25 to the variable age?	age == 25	DECLARE age = 25	SET age TO 25	age TO 25
22.	What does 2FA require for user access?	Two different password	Two different encryption keys	Two different authentication methods	Two different user account methods
23.	Which deployment method runs the old and new system at the same time?	Direct	Phased	Parallel	Pilot
24.	A cloud system automatically adds more servers when user demand increases. This feature demonstrates:	Reliability	Resource pooling	Horizontal scaling	Vertical scaling

25.	If a company encrypts its database, what happens to the stored data?	It is transformed into a format optimized for faster storage and retrieval.	It becomes unreadable without a key	It is converted into a structured representation that can be shared between different systems.	It becomes publicly accessible Read-only
26.	The statement "Is the temperature greater than 30°C?" corresponds to which flowchart symbol?				
27.	A programmer uses a loop that decreases values from 10 to 1. What is the main purpose of using a negative step in the loop?	Increase the loop speed	Skip iterations	Stop the loop immediately	Execute the loop in reverse order
28.	A data scientist studies how education level affects salary. In this case, salary is considered the:	Independent variable	Control variable	Dependent variable	Random variable
29.	If two variables increase or decrease together but do not necessarily cause each other, this relationship is called:	Correlation	Regression	Causation	Classification
30.	A household appliance monitors its contents, collects usage data, and communicates with a mobile device to provide real-time updates and notifications. This is an example of:	Cloud computing	Internet of Things (IoT)	Blockchain	Cybersecurity
31.	A manufacturing company separates the production process into design, assembly, testing, and packaging stages to improve efficiency. Which computational thinking technique is being used?	Pattern Recognition	Algorithm Design	Abstraction	Decomposition
32.	A research study includes participants only from one city even though the study is about the entire country. This situation may lead to:	Data accuracy	Random sampling	Selection bias	Reliable results
33.	A pilot trains using a computer system that imitates real flight conditions. This is an example of:	Model training	Virtual reality visualization	Simulation	Real-time data processing
34.	An infographic is used in research presentations mainly because it:	Stores large sets of raw research data for later use	Replace the need for detailed statistical analysis	Simplifies complex information using visual elements	Eliminates the need for written explanations in reports
35.	In white-box testing, what is the investigator primarily concerned with?	Examining internal code structure and logic flow	Evaluating software based on input and output without viewing code	Testing user experience and interface design only	Identifying and fixing errors during program execution

36.	Which operator is used to compare if two values are equal in a condition?	=	==	!=	< >
37.	Which statement will always execute in an if-elif-else structure if none of the conditions are met?	if	elif	else	ifelse
38.	Which of the following is the correct way to create a list in Python?	{1, 2, 3}	(1, 2, 3)	[1, 2, 3]	<1, 2, 3>
39.	Which of the following is an example of a primary source?	Diary	Textbook	News Report	Encyclopedia
40.	An online shopping website recommends products based on a customer's previous purchases. What does this demonstrate about the application of computer science?	Computers can analyze data to provide personalized services.	Computers can manufacture products automatically.	Computers can replace all human decision-making.	Computers can eliminate internet usage.
41.	Which technology is mainly used to connect headphones to a smartphone wirelessly?	Wi-Fi	Bluetooth	5G	Fiber optics
42.	Why are probing techniques used in qualitative interviews?	To avoid discussing topics that participants consider important	To ensure that all participants give identical answers to the questions	To reduce the amount of information collected during the interview	To investigate deeper into participants' responses and gain clarity
43.	How has technology improved data representation tools?	By making them more interactive and customizable	By removing the need for graphs and charts	By simplifying the data collection process	By replacing reports with digital content only
44.	Which of the following is an example of a computational artifact?	Mobile Applications	A physical book	A Calculator	A printed photograph
45.	Why is user on boarding important in an MVP?	Help users learn basic features and start using the product	Make the interface more complex	Collect extra unnecessary data	Slow down user use of the product
46.	What does t.penup() do in Turtle graphics	Stop drawing lines	Lifts the turtle	Start drawing lines	Turns the turtle
47.	What will the output of the following code be? numbers=[] for i in range(1,4): numbers.append(i) print(numbers)	[1,2,3]	[0,1,2]	[1,2,3,4]	[2,3,4]
48.	What is the output of the following code: def greet() print("Hello!") greet()	Nothing happens	Hello!	Error	greet

49.	Given the Boolean expression: $A + A.B$ Which of the following simplifies it correctly?	A	B	$A + B$	$A.B'$
50.	Identify the circuit: 	OR	XOR	NAND	NOR
51.	A system administrator monitors how a network behaves when thousands of users access it simultaneously. Which type of testing is being performed?	Load testing	Security testing	Functional testing	Unit testing
52.	A software company conducts a detailed evaluation to ensure that a proposed project meets all relevant government laws, industry standards, and regulatory requirements before the development work begins. This activity is an example of:	Economic feasibility	Technical feasibility	Legal feasibility	Operational feasibility
53.	Two users who have never met want to securely exchange messages over the internet without sharing a secret key in advance. Which encryption method should they use to ensure secure communication?	Symmetric Encryption	Symmetric Encryption	Hash encryption	Caesar cipher
54.	What will be the output? count = 0 for i in range(3): count += 2 print(count)	3	6	7	10
55.	What will be the output? ips = ["A", "B", "C"] for i in range(len(ips)): print(ips[i])	ABC	"A","B","C"	Error	123
56.	What will be the result of the following code? fruits=["apple", "banana", "cherry"] print("Grape" not in fruits)	True	False	Error	Grape
	STIMULUS/SITUATION/SCENARIO BASED MCQs				
SCENARIO#1 (FOR QUESTIONS 57-60)		Carefully study the following Python program: <pre>num = eval(input("Enter a number: ")) total = 0 for i in range(1, num + 1): if i % 2 == 0: total = total + i</pre>			

		else: total = total - i print("Final Value:", total)			
57.	If the user enters 4, what will be the output?	0	-2	2	4
58.	Suppose the condition is changed to if i%3 == 0: What will be the output?	multiple of 3 are added	only multiple of 3 are printed	loop executes only 3 time	syntax errors occurs
59.	How many odd number are subtracted when num = 15?	7	8	9	10
60.	Which type of error may occur if the user enters "a" as an input?	Syntax Error	Logical Error	Runtime Error	No error will occur
SCENARIO#2 (FOR QUESTIONS 61-64)		A school introduces a digital system to improve learning and decision-making. Students use an online learning platform to submit assignments, attend virtual classes, and communicate with teachers. The school collects student performance data and evaluate it to identify weak areas. Teachers also guide students about safe internet use, privacy, and identifying fake information. The system helps administration make decisions like improving subjects where students perform poorly.			
61.	The school wants to identify the weak subjects of the students. What is this process called?	Data processing	Data analysis	Data collections	Data transmission
62.	Which system feature allows assignments to be checked and feedback to be given without human involvement?	Input/output handling	Data management	Data storage	Automation
63.	A student receives an email asking for their password. What should they do?	Share password quickly	Ignore and report the email	Forward it to friends	Save it for later
64.	If a teacher uses charts to understand student performance trends, what is being applied?	Data visualization	Data collection	Data cleaning	Data analysis
SCENARIO#3 (FOR QUESTIONS 65-68)		A college installs a modern computer lab where all systems are connected via a star topology. Each computer requires a secure login, and students are advised not to share passwords. The system administrator also installs antivirus software and keeps the operating system updated regularly.			
65.	Which component is responsible for connecting all computers in the lab?	Router	Switch	Modem	Firewall
66.	Why is it important to regularly update the operating system?	To increase memory size	To improve security and performance	To reduce storage size	To delete files automatically
67.	A student shares their password with a friend. What is the most likely risk?	The friend accidentally upgrades the account to a premium version	Someone else could misuse the account, and the owner will be held responsible	the school network will block both students permanently	the password becomes stronger because it is used more frequently

68.	According to the above, which topology can be used for more reliable transmission instead of star topology?	Bus topology	ring topology	mesh topology	tree topology
SCENARIO#4 (FOR QUESTIONS 69-72)		A group of students starts an online business creating educational videos. They use social media platforms to promote content and analyze viewer data to improve their videos. They also ensure they do not use copyrighted material without permission.			
69.	Which tool is most likely used to understand which videos are most popular?	Spreadsheet software for recording viewer data	Viewer analytics tools	Video editing software	Social media content scheduler
70.	What risk might the students face when uploading content online?	Faster internet speed	Copyright infringement	Increased storage capacity	Better video quality
71.	What is the main benefit of using social media platforms for their online business?	Promoting content without paying for advertisements	Reaching a wider audience quickly	Reducing internet usage	Managing and storing videos locally on their device
72.	What does “digital entrepreneurship” mean?	Using digital tools for routine business tasks	Create new venture built on digital technology	Investing in digital start-ups for returns	Digitizing an existing traditional business
SCENARIO#5 (FOR QUESTIONS 73-76)		A banking app permits remote transactions but warns against public Wi-Fi to prevent data interception from rogue networks. However, this security restriction creates an equity issue for low-income users who rely on public internet due to expensive cellular plans. To bridge this gap, computer scientists implement advanced encryption like certificate pinning to secure transactions on any network. Ultimately, this scenario highlights the ongoing tension between maintaining strict cybersecurity and ensuring equitable digital access.			
73.	What type of system is a mobile banking app?	Enterprise system	Financial system	Embedded system	Scientific system
74.	Why are users advised to avoid public Wi-Fi?	It creates an unfair disadvantage for users who cannot afford cellular data	It causes the banking app to crash and stop working permanently	It forces the bank to pay for the users' internet access.	It deletes the users' bank accounts from the system.
75.	If a user transfers money using secure login, what is being ensured?	Fault tolerance	Data security	Load balancing	Bandwidth optimization
76.	What is a possible negative impact of mobile banking?	Increased security awareness	Risk of cyber fraud	Faster transactions	Instant accessibility
SCENARIO#6 (FOR QUESTIONS 77-80)		A school is developing a digital library system to help students search thousands of book records (title, author, ID) quickly and efficiently. Students can search by name or ID, and the system must return results fast. The development team must: • Break the system into smaller modules (search, storage, display) • Design efficient search and sort algorithms • Choose appropriate methods (linear or binary search) Test and improve the system for better performance			

77.	Which is the best example of decomposition in this system?	Treating the system as one large program	Dividing the system into search, storage, and display modules	Only storing books randomly	Removing all book categories
78.	What is the best example of pattern recognition in this system?	Designing the database structure	Observing that students frequently search for popular book titles	Writing pseudocode for sorting	Storing books in alphabetical order
79.	Why is linear search still used in some parts of the system?	It requires data to be sorted first	It works efficiently only on large datasets	It can search unsorted data without preprocessing	It always performs faster than binary search
80.	The system frequently adds new books one by one. Which sorting method is most suitable for maintaining a nearly sorted list?	Bubble sort	Insertion sort	Linear search	Binary search



Federal Board HSSC-I Examination
Computer Science Model Question Paper
National Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)
(50% MCQs & 50% Descriptive)

Time allowed: 1:20 hours

Total Marks: 40

Note: Answer all parts from Section 'B' and 'C' on the E-sheet at specifically provided space.

Write your answers on the allotted /given spaces.

SECTION-B [Marks: 4x7 = 28]

1.	Consider the following examples of scenarios and identify whether the waterfall or agile model would be the most suitable for development. a. Building construction b. Developing web application c. Weather forecasting d. Learning management system (LMS)	4	OR	Identify and correct the errors in the following Python code segment: length = input("Enter length") width = input(Enter width") area = length * width print("Area of rectangle is:" , area) if area > 0 print("Valid area")	4
2.	What is encryption in the context of information security? An organization wants to securely send large volumes of sensitive data over the internet and can choose between symmetric and asymmetric encryption. Which encryption method is more appropriate for this situation? Give any three reasons to support your answer.	4	OR	Complete the trace table for the following algorithm and state the final value of count. A = [5, 8, 3, 8, 2] count = 0 For i = 0 to 4 If A[i] = 8 Then count = count + 1 End If End For	4
3.	Write the four parameters used to evaluate an algorithm.	4	OR	Write down any three positive impacts of AI systems.	4
4.	Explain any experimental design principle in data science with relevant examples.	4	OR	What is assistive technology? Write down its two uses in daily life.	4
5.	A city healthcare provider is upgrading its software system to improve patient care and enhance data security. The organization must ensure that daily operations are not disrupted and sensitive patient data remains protected during the transition. a. Identify the most suitable SDLC implementation method for this scenario. b. State two possible risks of this implementation method. c. Suggest one way to minimize the identified risk.	4	OR	A software development team is preparing to launch a new mobile application. Apply the concept of user testing to recommend how it should be used before release. Describe any two ways in which user testing could help improve the application's quality and usability.	4
6.	Assume the variables x, y and z where x = 4, y = 8, and z = 2. What value will be stored in result1, result2, result3 and result4 after executing following Python statements? a) result1 = y // z b) result2 = z ** 3 c) result4 = x & z	4	OR	A survey report contains a large amount of statistical data. Elaborate how an infographic can improve the communication of this information. Discuss two key features of effective infographics and their role in making data easier to understand.	

7.	What is the difference between parameters and arguments in functions?	4	OR	Differentiate between supervised and unsupervised learning with daily life example.	4
SECTION-C [Marks: 6x2 = 12]					
8.	Given a supply chain management scenario, apply blockchain technology to track products from manufacturer to customer. Specify the blockchain network type (public, private, consortium, or hybrid) that would best support the system and justify your selection with an example.	6	OR	A student is provided with an unsorted list of numbers, as 48, 10, 14, 37, 13, 29, and is required to arrange them in ascending order using the Bubble sort algorithm. Demonstrate with the help of algorithm how Bubble Sort rearranges the list showing how the different elements move to their correct position. Write the final sorted order of the given list after completing all passes.	6
9.	Simplify the Boolean Function F, using Karnaugh Map. $F = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$ Also construct a logic circuit for simplified expression.	6	OR	A teacher wants to analyze students' performance by identifying the highest and lowest marks in a class. This will help in understanding overall achievement and improvement areas. Write a Python function that takes marks of 10 students as input and returns both the maximum and minimum marks	6

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Computer Science Model Question Paper
National Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)
(50% MCQs & 50% Descriptive)
Alignment of Questions with Student Learning Outcomes

Sr No	Section: Q. No. (Part no.)	Content Domain / Area	Student Learning Outcomes	Cognitive Level *	Allocated Marks in Model Paper
1.	A: Q#1(1).	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	K	0.5
2.	A: Q#1(2).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	K	0.5
3.	A: Q#1(3).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	K	0.5
4.	A: Q#1(4).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	K	0.5
5.	A: Q#1(5).	A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	K	0.5
6.	A: Q#1(6).	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	K	0.5
7.	A: Q#1(7).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	K	0.5
8.	A: Q#1(8).	D	[SLO CS-11-D-02] Students will understand and explain experimental design in data science	K	0.5
9.	A: Q#1(9).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	K	0.5
10.	A: Q#1(10).	A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	K	0.5
11.	A: Q#1(11).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	K	0.5
12.	A: Q#1(12).	C	[SLO CS-11-C-03] Students should be able to draw shapes using TurtleGraphics functions in Python	K	0.5
13.	A: Q#1(13).	C	[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	K	0.5
14.	A: Q#1(14).	C	[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	K	0.5

15.	A: Q#1(15).	D	[SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications	K	0.5
16.	A: Q#1(16).	D	[SLO CS-11-D-02] Students will understand and explain experimental design in data science	K	0.5
17.	A: Q#1(17).	H	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	K	0.5
18.	A: Q#1(18).	C	[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	K	0.5
19.	A: Q#1(19).	A	[SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams.	K	0.5
20.	A: Q#1(20).	B	[SLO CS-11-B-02] Apply common search, and sort algorithms	K	0.5
21.	A: Q#1(21).	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	U	0.5
22.	A: Q#1(22).	A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	U	0.5
23.	A: Q#1(23).	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	U	0.5
24.	A: Q#1(24).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	U	0.5
25.	A: Q#1(25).	A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	U	0.5
26.	A: Q#1(26).	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	U	0.5
27.	A: Q#1(27).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	U	0.5
28.	A: Q#1(28).	D	[SLO CS-11-D-02] Students will understand and explain experimental design in data science	U	0.5
29.	A: Q#1(29).	D	[SLO CS-11-D-02] Students will understand and explain experimental design in data science	U	0.5
30.	A: Q#1(30).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	U	0.5
31.	A: Q#1(31).	B	[SLO CS-11-B-02] Apply common search, and sort algorithms	A	0.5

32.	A: Q#1(32).	D	[SLO CS-11-D-02] Students will understand and explain experimental design in data science	U	0.5
33.	A: Q#1(33).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
34.	A: Q#1(34).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
35.	A: Q#1(35).	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	U	0.5
36.	A: Q#1(36).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	U	0.5
37.	A: Q#1(37).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	U	0.5
38.	A: Q#1(38).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	U	0.5
39.	A: Q#1(39).	F	[SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its source	U	0.5
40.	A: Q#1(40).	E	[SLO CS-11-E-02] Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs	U	0.5
41.	A: Q#1(41).	F	[SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity	U	0.5
42.	A: Q#1(42).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
43.	A: Q#1(43).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
44.	A: Q#1(44).	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	K	0.5
45.	A: Q#1(45).	H	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	U	0.5
46.	A: Q#1(46).	C	[SLO CS-11-C-03] Students should be able to draw shapes using TurtleGraphics functions in Python	U	0.5

47.	A: Q#1(47).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	U	0.5
48.	A: Q#1(48).	C	[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	U	0.5
49.	A: Q#1(49).	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	A	0.5
50.	A: Q#1(50).	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	A	0.5
51.	A: Q#1(51).	A	[SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems via network topology	A	0.5
52.	A: Q#1(52).	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	A	0.5
53.	A: Q#1(53).	A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	A	0.5
54.	A: Q#1(54).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	A	0.5
55.	A: Q#1(55).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	A	0.5
56.	A: Q#1(56).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	A	0.5
57.	A: Q#1(57).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	U	0.5
58.	A: Q#1(58).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	U	0.5
59.	A: Q#1(59).	C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	U	0.5
60.	A: Q#1(60).	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	A	0.5
61.	A: Q#1(61).	D	[SLO CS-11-D-03] Students will analyze pre-existing data sets to create summary statistics and data visuals (such as bar charts, pie charts, line graphs, etc.)	A	0.5
62.	A: Q#1(62).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	A	0.5

63.	A: Q#1(63).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	A	0.5
64.	A: Q#1(64).	D	[SLO CS-11-D-03] Students will analyze pre-existing data sets to create summary statistics and data visuals (such as bar charts, pie charts, line graphs, etc.)	A	0.5
65.	A: Q#1(65).	A	[SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems via network topology	U	0.5
66.	A: Q#1(66).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
67.	A: Q#1(67).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
68.	A: Q#1(68).	A	[SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems via network topology	U	0.5
69.	A: Q#1(69).	H	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	U	0.5
70.	A: Q#1(70).	F	[SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its source	U	0.5
71.	A: Q#1(71).	G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	0.5
72.	A: Q#1(72).	H	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	K	0.5
73.	A: Q#1(73).	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	K	0.5
74.	A: Q#1(74).	F	[SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity	U	0.5
75.	A: Q#1(75).	F	[SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its source	U	0.5
76.	A: Q#1(76).	F	[SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its source	U	0.5
77.	A: Q#1(77).	B	[SLO CS-11-B-02]Apply common search, and sort algorithms	K	0.5
78.	A: Q#1(78).	B	[SLO CS-11-B-02]Apply common search, and sort algorithms	A	0.5

79.	A: Q#1(79).	B	[SLO CS-11-B-02]Apply common search, and sort algorithms	U	0.5
80.	A: Q#1(80).	B	[SLO CS-11-B-02]Apply common search, and sort algorithms	A	0.5

SECTION B									
SR#	SEC: QUE# PART	DOMAIN	QUESTION	COGNITIVE	OR		QUESTION	COGNITIVE	
81.	B: Q#1.	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	U	OR	C	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	U	4
82.	B: Q#2.	A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	U	OR	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	A	4
83.	B: Q#3.	B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	K	OR	E	[SLO CS-11-E-02] Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs	K	4
84.	B: Q#4.	D	[SLO CS-11-D-02] Students will understand and explain experimental design in data science	K	OR	F	[SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity	K	4
85.	B: Q#5.	A	[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.	A	OR	H	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	A	4

86.	B: Q#6.	C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	U		G	[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	U	
87.	B: Q#7.	C	[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	U	OR	D	[SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications	U	4
SECTION C									
88.	C: Q#8.	E	[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	U	OR	B	[SLO CS-11-B-02] Apply common search, and sort algorithms	U	6
89.	C: Q#9.	A	[SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and	A	OR	C	[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	A	6

Table of specifications (ToS) Model Paper Computer Science HSSC I
(50% MCQs & 50% Descriptive)

Content Domain / Area	Domain A: Computer Systems	Domain B: Computational Thinking and Algorithms.	Domain C: Programming Fundamentals	Domain D: Data and Analysis	Domain E: Applications of Computer Science	Domain F: Impacts of Computing	Domain G: Digital Literacy	Domain H: Entrepreneurship in the digital age	Total Marks	Percentage of cognitive level
Cognitive Level										
Knowledge	A-5 (0.5) A-10 (0.5) A-19 (0.5)	A-1 (0.5) A-6 (0.5) A-20 (0.5) A-44 (0.5) A-77 (0.5) B-Q3 (f) 4	A-7 (0.5) A-11 (0.5) A-12 (0.5) A-13 (0.5) A-14 (0.5) A-18 (0.5)	A-8 (0.5) A-15 (0.5) A-16 (0.5) B-Q4 (f) 4	A-2 (0.5) A-3 (0.5) A-4 (0.5) A-9 (0.5) A-73 (0.5) B-Q3 (s) 4	B-Q4 (s) 4		A-17 (0.5) A-72 (0.5)	28	23%
Understanding	A-22 (0.5) A-23 (0.5) A-25 (0.5) A-35 (0.5) A-65 (0.5) A-68 (0.5) B-Q1 (f) 4 B-Q2 (f) 4	A-21 (0.5) A-26 (0.5) A-79 (0.5)	A-27 (0.5) A-36 (0.5) A-37 (0.5) A-38 (0.5) A-46 (0.5) A-47 (0.5) A-48 (0.5) A-57 (0.5) A-58 (0.5) A-59 (0.5) B-Q6 (f) 4 B-Q7 (f) 4 B-Q1 (s) 4	A-28 (0.5) A-29 (0.5) A-32 (0.5) B-Q7 (s) 4	A-24 (0.5) A-30 (0.5) A-40 (0.5) C-Q8 (f) 6	A-39 (0.5) A-41 (0.5) A-70 (0.5) A-74 (0.5) A-75 (0.5) A-76 (0.5)	A-33 (0.5) A-34 (0.5) A-42 (0.5) A-43 (0.5) A-66 (0.5) A-67 (0.5) A-71 (0.5) B-Q6 (s) 4	A-45 (0.5) A-69 (0.5)	54	45%
Application	A-49 (0.5) A-50 (0.5) A-51 (0.5) A-52 (0.5) A-53 (0.5) B-Q5 (f) 4 C-Q9 (f) 6	A-31 (0.5) A-78 (0.5) A-80 (0.5) B-Q2 (s) 4 C-Q8 (s) 6	A-54 (0.5) A-55 (0.5) A-56 (0.5) A-60 (0.5) C-Q9 (s) 6	A-61 (0.5) A-64 (0.5)	A-62 (0.5)		A-63 (0.5)	B-Q5 (s) 4	38	32%
Total Marks	25	19.5	28	12	14.5	7	8	6	120	100%
Total Percentages	21%	16%	23%	10%	12%	6%	7%	5%	100%	

Note: This ToS does not reflect policy, but it is particular to this model question paper.

- 1 Proportionate / equitable representation of the content areas as per the defined ranges may be ensured.
- 2 The percentage of cognitive level is 30%, 50%, and 20% for knowledge, understanding, and application, respectively with $\pm 5\%$ variation.
- 3 While selecting alternative questions for Short Response Questions (SRQs) and Extended Response Questions (ERQs), it must be kept in mind that:
 - Difficulty levels of both questions should also be same
 - SLOs of both the alternative questions must be different

Key:	Section-A [Objectives]:	SECTION-PART (marks)	example: A-1 (0.5)
	Section B & C [SRQs/ ERQs Question]:	SECTION-Question Number (part/ second choice) marks	example: B-Q1 (f / s) 3 OR <u>C-Q7 (f / s) 6</u>



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