



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



No.1-10/FBISE/RES/652

30 August, 2024

**Subject: IMPLEMENTATION OF ASSESSMENT FRAMEWORKS AND MODEL QUESTION PAPERS DEVELOPED ON NATIONAL CURRICULUM OF PAKISTAN (NCP) 2022-2023**

In continuation to this office Notifications bearing No.1-10/FBISE/RES/383 dated 14 March 2024 and No.1-10/FBISE/RES/422 dated 19 March 2024 on the subject of Implementation of National Curriculum of Pakistan (NCP) 2022-23, Assessment Frameworks, Model Question Papers along with SLOs Alignment Charts and Tables of Specifications (ToS) at SSC-I and HSSC-I levels in the subjects of English Compulsory, Urdu Compulsory, Pakistan Studies (SSC-I), Islamiyat Compulsory (HSSC-I), Physics, Chemistry, Biology, Mathematics and Computer Science are hereby uploaded on FBISE Website [www.fbise.edu.pk](http://www.fbise.edu.pk). The Weblink is [https://fbise.edu.pk/curriculum\\_model\\_paper.php](https://fbise.edu.pk/curriculum_model_paper.php).

2. It is important to note that the Assessment Frameworks which contain all the SLOs of the curriculum 2022-23 will guide students, teachers and paper setters. Students will receive clear instructions on how to prepare for examinations. Teachers will use the Frameworks to understand what to teach in class and to prepare their students for the final examinations. Similarly, paper setters will use these documents for guidance in creating examination papers. It may be noted that the SLOs of Summative Assessment mentioned in the Assessment Frameworks will be included in the Final Board Examinations, whereas the SLOs of Formative Assessment will NOT be included in the Final Board Examinations; however, they will be part of teaching-learning activity in the class.

3. It is reiterated that the examinations of all the above mentioned subjects will be based on Student Learning Outcomes (SLOs) given in the respective curriculum (Assessment Frameworks) instead of textbooks. Educational institutions, students and teachers may consult the books of publishers reviewed by National Curriculum Council available on its Weblink <https://ncc.gov.pk/SiteImage/Misc/files/Annexures.pdf>. Moreover, the institutions are free to rely on any other valid and reliable instructional/reference material to fulfil the instructional requirements of the SLOs of these subjects.

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ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

# COMPUTER SCIENCE

## Grade XI

NATIONAL CURRICULUM  
2022-23



FEDERAL BOARD OF  
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**FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION**

**H-8/4, ISLAMABAD**



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

# 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. Mrs. Rozina Faheem, Principal, F G College of Home Economic and Management Sciences, F-11/1 Islamabad
2. Mrs. Sadaf Zehra, Associate Professor, Islamabad Model College for Girls (PG), F-7/2, Islamabad
3. Mr. Waseem Aziz, Assistant Professor, Islamabad College for Boys, G-6/3, Islamabad

The whole work was successfully accomplished under the able supervision and guidance of Syed Junaid Akhlaq, 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 AF.

**MIRZA ALI**  
Director (Research & Academics)  
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**

<b>Content Domain/ Area</b>	<b>SLO No./ Description</b>	<b>Form of Assessment</b>	<b>Cognitive Level (Knowledge, Understanding, Application)</b>	<b>Remarks</b>	<b>Number of Periods required (1 period= 40 minutes)</b>
A: Computer Systems	<p>[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.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• Boolean functions</li> <li>• Boolean expressions</li> <li>• Boolean identities</li> <li>• Duality</li> <li>• What is digital logic</li> <li>• What makes analog and digital signals different</li> <li>• What are logic gates</li> <li>• What are truth tables</li> <li>• What are switches</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Construct Boolean functions, expressions, and identities.</li> <li>• Recognize duality</li> <li>• Identify different logic gates and explain their uses</li> <li>• Create truth tables for expressions up to 3 inputs</li> <li>• Draw logic gates for a Boolean expression</li> <li>• Draw a truth table for a logic gate to identify the outputs</li> </ul> <p>Student will know</p>	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	<b>30</b>

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	<ul style="list-style-type: none"> <li>• Key terms: Karnaugh maps, AND, OR, NOT, NAND gates, XOR</li> <li>• How to create truth tables</li> <li>• How to identify logic gates and understand their usage</li> </ul>				
	<p>[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.</p> <p>Students will understand that</p> <ul style="list-style-type: none"> <li>• What is a Software Development Life Cycle(SDLC) <ul style="list-style-type: none"> <li>○ What are the different activities involved in each phase of the SDLC</li> </ul> </li> <li>• (Advanced) What are basic software processes and Agile, Water fall software process models</li> </ul> <p>Students will know</p> <ul style="list-style-type: none"> <li>• Key terms: SDLC, bug, Agile, Waterfall, debugging, testing, design patterns, UML.</li> <li>• Key activities in software development and the role of software development processes</li> <li>• The engineering nature of software development</li> <li>• Key concepts in software development such as risk and quality</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Relate the different stages of SDLC(analysis, design, coding, testing etc.) to a case study</li> <li>• Plan a software project from beginning (design) to end(test and launch)</li> <li>• (Advanced)Explain common software development processes(agile etc.)</li> <li>• Explain black box and white box testing</li> </ul>	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)
	<p><b>[SLO CS-11-A-03]</b> Students will be able to understand and explain the scalability and reliability of networking systems via network topology</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• Different types of network topologies</li> <li>• Design, common access, and use of topologies</li> <li>• Scalability and reliability</li> <li>• Preparing for scale and reliability through load and system testing</li> <li>• Scalability and reliability in cloud computing</li> </ul> <p>Students will know</p> <ul style="list-style-type: none"> <li>• Key terms: Network topology, Bus, Ring, Tree, Star, Mesh, Hybrid, Ethernet, CSMA, Token passing, client, Server, root, node...</li> <li>• Advantages and disadvantages of each network topology</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Measure availability of a system</li> <li>• Prepare systems so they run with high reliability and can scale well</li> <li>• Test the scalability and reliability of a system</li> </ul>	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	
	<p><b>[SLO CS-11-A-04]</b> Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• Cybersecurity</li> <li>• Encryption</li> <li>• Ways a system can be attacked</li> <li>• Basic security frameworks</li> <li>• Security analysis and proactive protection of systems against cyberattacks</li> <li>• Data policies and privacy policies and how they can help keep your information safe</li> </ul>	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)
	<p>Students will know</p> <ul style="list-style-type: none"> <li>• Key terms: Cryptography, 2FA, firewall, DDoS, Hacking, Authentication, Authorization, Hashing, Malware, Phishing, XSS, Plaintext, Ciphertext, Encryption, Decryption....</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Protect their computers and setup online access taking into account the security risks they are prone to</li> <li>• Understand how basic cyberattacks are constructed and applies to real systems</li> <li>• Analyze cyber security risk and create a plan to prioritize risk decisions</li> <li>• Understand basic encryption techniques and algorithms used to protect sensitive data</li> <li>• How to protect sensitive apps and data through strong passwords, 2 factor authentication and encryption techniques.</li> </ul>				
B: Computational Thinking and Algorithms	<p><b>[SLO CS-11-B-01]</b> Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.</p> <p>Students will understand</p> <ul style="list-style-type: none"> <li>• How to use different methods to design and construct a solution to a computational problem</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Create pseudocode to address computational problems in the correct font, size, style, indentation, case, line numbers, comments, data type keywords, variable assignments &amp; declarations, common operators, and key commands</li> <li>• Systematically test computational artifacts</li> <li>• Analyse an algorithm presented as a flow chart in terms of include tracing an algorithm as well as assessing its correctness.</li> </ul>	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	<b>20</b>

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	<ul style="list-style-type: none"> <li>Evaluate algorithms in terms of their efficiency, correctness, and clarity</li> </ul> <p>[SLO CS-11-B-02]Apply common search, and sort algorithms</p> <p>Students will understand</p> <ul style="list-style-type: none"> <li>Problem solving methods using simple example of               <ol style="list-style-type: none"> <li>Abstraction</li> <li>Decomposition</li> <li>Pattern recognition</li> </ol> </li> <li>Algorithmic approaches to solve practical exercises of algorithms</li> <li>When to use various search and sort algorithms such as linear search, binary search, insertion sort, bubble sort, etc.</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>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.)</li> </ul>	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 Fundame ntals	<p>[SLO CS-11-C-01] Students should understand the importance of computer programming and applications</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>Programs use the basic components of a computer to take inputs, process the input, and produce output</li> <li>The Agile and Waterfall are models of the Software Development Life cycle and are used to gather requirements and implement software</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>Take a real-world problem, propose a software solution, and implement it.</li> </ul>	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)
	<p>[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• What is Python, why is it used</li> <li>• What type of problems can be solved using Python</li> <li>• Input/Output handling</li> <li>• Variables in Python</li> <li>• Operators in Python</li> <li>• Sequence, Selection, Repetition in Python</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Write and execute a program in Python using an IDE like replit.com (online) VS Code(offline) that uses variables, sequence, selection, and repetition</li> </ul>	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	
	<p>[SLO CS-11-C-03] Students should be able to draw shapes using Turtle Graphics functions in Python</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• How to use the Python Turtle Library <ul style="list-style-type: none"> <li>○ Turtle methods</li> <li>○ Methods of screen</li> <li>○ Turtle motion</li> <li>○ Use of events</li> <li>○ Create/draw shapes</li> <li>○ Compound Shapes</li> </ul> </li> <li>• How to create shapes by means of instructions to a “turtle” to move in a given direction</li> <li>• How to create more complex shapes by allowing the “turtle” to lift the pen while moving</li> </ul> <p>Students will be able to...</p>	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)
	<ul style="list-style-type: none"> <li>Write and execute a program in Python to create complex shapes using the Turtle library</li> </ul>				
	<p><b>[SLO CS-11-C-04]</b>Students should be able to understand the need for libraries and learn the use of some simple libraries in Python.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>The concept of abstraction allows the use of complex libraries without knowing their internal implementation</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>Find and use a third-party Python library that is simple to use but has a complex implementation</li> </ul>	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	
	<p><b>[SLO CS-11-C-05]</b> Students should be able to translate simple algorithms that use sequence and repetition in Python.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>What are variables, sequence, repetition, and lists in Python</li> <li>How to use sequence and repetition to manipulate lists in Python</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>Write and execute a Python program that uses variables, sequence, and repetition to populate a list</li> <li>Write and execute a Python program that uses variables, sequence, and repetition to find an element in a list</li> </ul>	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	
	<p><b>[SLO CS-11-C-06]</b> Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>Why we need functions</li> <li>How to decompose a large problem into sub-problems</li> <li>How to identify duplication in their code</li> </ul>	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)
	<ul style="list-style-type: none"> <li>• How to move duplicated code into a function</li> <li>• How to create/define/invoke a function</li> <li>• Types of Functions</li> <li>• Function parameters/arguments</li> <li>• Scope of variables</li> <li>• Returning value from a function</li> <li>• Pass by value</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Write and execute a Python program that solves a large problem by decomposing into subproblems</li> <li>• Write a Python program that invokes functions within loops</li> <li>• 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.)</li> </ul>				
	<p><b>[SLO CS-11-C-07]</b> Students will determine ways of debugging their code in Python</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• Code written outside of a function is hard to test</li> <li>• Code written inside a function can be tested</li> <li>• That they can write code that calls functions to ensure the results are correct</li> <li>• 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</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Write code to invoke functions and check their return values for correctness</li> <li>• Read through code and dry run by hand to find bugs</li> </ul>	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)
D: Data and Analysis	<p>[SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications</p> <p>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:</p> <ul style="list-style-type: none"> <li>• The linear relationship between variables (using correlation coefficients and build the <math>y = mx + c</math> using slope and intercept)</li> <li>• The structure of linear models, K-means, Smoothing</li> </ul> <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• 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 access the linear association)</li> <li>• Identify the slope and intercept for the linear relationship</li> <li>• Build their first statistical model (Microsoft Excel Python, Weka, or Microsoft Excel)</li> <li>• (Advanced) Interpret the results of the model including statistical significance and beta values</li> <li>• (Advanced) Draw conclusions from the model output to inform real world policies</li> </ul>	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
	<p>[SLO CS-11-D-02] Students will understand and explain experimental design in data science</p> <p>Students will understand</p>	Summative for Theory and Practical	Knowledge / Understanding/ Application	Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	<ul style="list-style-type: none"> <li>• The importance of experimentation in data science as a tool to differentiate between correlation and causation</li> <li>• Measures used in experimentation</li> <li>• Real work experimentation examples</li> </ul> Student will know... <ul style="list-style-type: none"> <li>• Data collection methods, including traditional methods of designed experiments and observational studies and surveys</li> <li>• Statistics as a process for making inferences about population parameters based on a random sample from that population</li> </ul> Students will be able to <ul style="list-style-type: none"> <li>• Differentiate between correlation and causation</li> <li>• Compare and contrast population vs. sample</li> <li>• Compare and contrast parameter vs. statistic</li> <li>• How to do their own experiments through in-class activities</li> <li>• Apply a real-world business problem where experimentation is used.(e.g. Facebook, YouTube, on line retail)</li> <li>• Explain situations where one measure of central tendency or spread may be more appropriate than others</li> <li>• (Advanced) Identify reports that use special data structures (census, survey, observational study, and randomized experiment)</li> <li>• (Advanced) Use RStudio/python to re-randomize data</li> <li>• (Advanced) Compute measures of central tendency and spread in RStudio/python</li> </ul>	Based Assessment		Practical Based Assessment	
	<p>[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.)</p> <p>Students will understand</p>	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	

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
	<ul style="list-style-type: none"> <li>• Definitions and analysis of data and data products (charts, graphs, statistics)</li> <li>• How to construct multiple views of data</li> <li>• How to use analyze data through computational tools such as Excel, Google Sheets, R, or Python</li> </ul> <p>Students will</p> <ul style="list-style-type: none"> <li>• Apply their knowledge of visualization techniques (such as measures of center and spread, boxplots, bar plots , histograms, scatterplots) to data</li> <li>• Read plots (identify the name of the plot, interpret the axes, look for trends, identify confounding factors)</li> <li>• Use visualization to tell stories with data</li> <li>• (Advanced) Create basic plots in RStudio</li> <li>• (Advanced) Create frequency tables in RStudio</li> <li>• (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</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Collect, clean, and manipulate data using tools such as Excel, Google Sheets, R, or Python</li> <li>• Analyze data using statistical techniques and create visualizations to communicate their findings</li> <li>• Understand the connection of databases to machine learning</li> <li>• (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</li> </ul>			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)
E: Applications of Computer Science	<p>[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• Advancement in technologies like smaller size, higher processing power, longer battery power, AI techniques, cloud computing, and connectivity have enabled IoT applications</li> <li>• Network connectivity, Processing power, and Cryptography are technologies that enable blockchains</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Analyze technologies that have enabled IoT and blockchain applications</li> </ul>	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	15
	<p>[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</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• That there are different stakeholders that have vested interest in the outcomes of an AI algorithm</li> <li>• These different stakeholders might have conflicting requirements for these algorithms</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Explore some of the stakeholders and describe their interest in AI algorithms</li> <li>• Assess policies that can help protect different stakeholders' interests</li> <li>• Evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs</li> </ul>	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	
F: Impacts of	[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	Summative for Theory	Knowledge / Understanding	Question(s) will be asked in the Annual theory paper	15

Content Domain/ Area	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
Computing	<p>Students will understand...</p> <ul style="list-style-type: none"> <li>• Safe &amp; responsible use of information sources</li> <li>• Human bias is everywhere including data collection and information sharing</li> </ul> <p>Students will know...</p> <ul style="list-style-type: none"> <li>• The difference between data source verification tasks that should be completed by humans and those that are ideally completed by computing devices</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Identify sources of reliable and unreliable information</li> <li>• Address issues of bias in the designs of their computing applications</li> <li>• Conduct data searches to obtain reliable information</li> </ul>				
	<p><b>[SLO CS-11-F-02]</b> Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>• The uses of assistive technologies for people with disabilities and the elderly</li> <li>• The impact of the digital divide on connectivity and how accessibility to information affects the lives of different people</li> </ul> <p>Students will know...</p> <ul style="list-style-type: none"> <li>• The different technological innovations we are using to improve communication between people such as Wi-Fi networks, Bluetooth etc.</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>• Discuss the impact of computing technology on business and commerce</li> <li>• Collaborate on strategies to provide equity and equal access to information</li> </ul>	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)
	<ul style="list-style-type: none"> <li>(Advanced) Distinguish between impact of tasks that are ideally completed by humans and those that are ideally completed by computing devices</li> </ul>				
G: Digital Literacy	<p>[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)</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>Definitions of data collection strategies (e.g. qualitative interviews, surveys, prototypes, simulations)</li> <li>Best practices on how to present primary &amp; secondary data for a research question</li> <li>How to design data-collection approach to gather original data</li> </ul> <p>Students will know...</p> <ul style="list-style-type: none"> <li>How to use appropriate data collection strategies for various types of research questions</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>Design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)</li> <li>Present data using appropriate digital tools (such as graphs or infographics in worksheets, presentations, reports etc.)</li> </ul>	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
H: Entrepreneurship in the digital age	<p>[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea</p> <p>Students will understand...</p> <ul style="list-style-type: none"> <li>What is prototyping and why is it important</li> <li>How to design and test a prototype</li> </ul> <p>Students will be able to...</p> <ul style="list-style-type: none"> <li>Design, build and test the prototype</li> </ul>	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)
	<ul style="list-style-type: none"> <li>• Derive learnings from prototype testing</li> <li>• Iterate business solution based on prototype test results</li> </ul>				

**Note: PBA STANDS FOR “PRACTICAL BASED ASSESSMENT”**



# Federal Board HSSC-I Examination

## Computer Science Model

### Question Paper (Curriculum 2022-23)

#### **Section - A (Marks 13)**

Time Allowed: 20 minutes

**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					
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Version No.			
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Candidate Sign. \_\_\_\_\_

Invigilator Sign. \_\_\_\_\_

Q1. Fill the relevant bubble against each question according to curriculum. Each part carries one mark.

Sr no.	Question	A	B	C	D	A	B	C	D
i.	What is the primary purpose of using a histogram in data analysis?	To show the relationship between two variables	To display the distribution of a single variable	To summarize the mean and standard deviation of data	To compare categorical data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ii.	Which computational thinking process involves removing unnecessary details to focus on the essential parts?	Decomposition	Pattern Recognition	Abstraction	Algorithm Design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
iii.	Which of the following is a method used to prevent unauthorized access to a network?	Worm	Virus	Firewall	Spyware	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
iv.	What is the hexadecimal representation of the binary number <b>10101110</b> ?	6F	AE	9C	B4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
v.	Which of the following is an example of practicing good digital citizenship?	Engaging in respectful online communication	Sharing sensitive information without permission	Plagiarizing content from the internet	Ignoring copyright laws	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vi.	Which of the following symbol is used to identify single line comment in Python?	//	#	/*	>>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

vii.	Which of the following is an example of an efficient algorithm?	An algorithm that finds an item in a list of 1000 items by checking each one	An algorithm that prints all the numbers from 1 to 1000	An algorithm that finds an item in a sorted list of 1000 items by dividing the list in half each time	An algorithm that repeats the same task multiple times without any change	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
viii.	What is the primary purpose of a digital footprint?	To record all digital activities and data shared online, which can be accessed by others	To track physical steps and location	To store cookies and browsing history for future reference	To provide secure access to online banking	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
ix.	In the field of artificial intelligence, which subfield focuses on enabling machines to understand and interpret human language?	Computer Vision	Robotics	Machine Learning	Natural Language Processing	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
x.	Which of the following statements best describes the role of digital entrepreneurship?	It focuses solely on traditional business models without incorporating digital technologies	It relies on manual processes and paperwork for business operations	It avoids online marketing and sales channels	It leverages digital technologies to create innovative products, services, or business models	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
xi.	Which of the following is a significant environmental concern associated with the growth of data centers?	Lower water consumption	Decreased electronic waste	Higher carbon emissions due to energy consumption	Increased paper waste	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
xii.	What will be the output of the following statement? <b>for i in range(5): print(i)</b>	0 1 2 3 4 5	0 1 2 3 4	1 2 3 4 5	Error in statement	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
xiii.	Which of the following digital tools is commonly used for market research and analysis in digital entrepreneurship?	Social media platforms	Email clients	Spreadsheet software	Fax machines	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>



# Federal Board HSSC-I Examination

## Computer Science Model Question

### Paper (Curriculum 2022-23)

Time allowed: 2.40 hours

Total Marks: 62

Note: Answer all parts from Section 'B' and all questions from Section 'C' on the **E-sheet**.  
Write your answers on the allotted/given spaces.

### SECTION – B (Marks 42)

Q.2	Question	Marks		Question	Marks								
i.	Correct the following Python code segments by removing errors:	3	<b>OR</b>	Given the following pseudocode:	3								
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Incorrect code</th> <th style="width: 50%;">Code without errors</th> </tr> </thead> <tbody> <tr> <td>num1 = 10 num2 = "5" result = num1 + num2 print(result)</td> <td></td> </tr> <tr> <td>fruits = ["Islamabad", "Karachi", "Lahore"] print(fruits [3])</td> <td></td> </tr> <tr> <td>num1 = 10 num2 = 0 result = num1 / num2 print(result)</td> <td></td> </tr> </tbody> </table>			Incorrect code		Code without errors	num1 = 10 num2 = "5" result = num1 + num2 print(result)		fruits = ["Islamabad", "Karachi", "Lahore"] print(fruits [3])		num1 = 10 num2 = 0 result = num1 / num2 print(result)		Step 1: Initialize a variable sum with 0 Step 2: Initialize a variable i with 2 Step 3: While i is less than or equal to N Step 4: Add i to sum Step 5: Increment i by 2 Step 6: Print sum  Modify the pseudocode to print the product of odd numbers from 1-30.
	Incorrect code			Code without errors									
	num1 = 10 num2 = "5" result = num1 + num2 print(result)												
fruits = ["Islamabad", "Karachi", "Lahore"] print(fruits [3])													
num1 = 10 num2 = 0 result = num1 / num2 print(result)													
ii.	What is slope and intercept for the linear relationship? Give example from daily life.	3	<b>OR</b>	Briefly explain any three types of cloud computing models.	3								
iii.	A city healthcare provider is in the process of upgrading its software to improve patient care and enhance data security. Using this case study, recommend the most suitable implementation method of SDLC. Justify your recommendation by outlining any two considerations.	1+2	<b>OR</b>	Differentiate between supervised and unsupervised learning with daily life example.	3								
iv.	Why prototyping is important? Give any three reasons.	3	<b>OR</b>	Compare star and ring topologies with respect to scalability, reliability, and architecture.	3								
v.	Compare local and global variable with example.	2	<b>OR</b>	Consider the following examples of scenarios and identify whether the waterfall or agile model would be the most suitable for development. <ul style="list-style-type: none"> <li>a. Building construction</li> <li>b. Developing web application</li> <li>c. Digital marketing campaign</li> <li>d. Automobile production</li> <li>e. Public works projects</li> <li>f. Research projects</li> </ul>	0.5x 6								

vi.	What is an assistive technology? Also write down its two uses in daily life.	1+2	<b>OR</b>	Write down any three positive impacts of AI systems.	3																				
vii.	Categorize the following scenarios by identifying whether the linear or binary search algorithms is more appropriate choice. Also justify your answer. <table border="1" data-bbox="170 537 657 873"> <thead> <tr> <th>Scenario</th> <th>Search algorithm</th> <th>Reason</th> </tr> </thead> <tbody> <tr> <td>Bounded data ranges</td> <td></td> <td></td> </tr> <tr> <td>Small data sets</td> <td></td> <td></td> </tr> <tr> <td>Large, sorted data sets</td> <td></td> <td></td> </tr> </tbody> </table>	Scenario	Search algorithm	Reason	Bounded data ranges			Small data sets			Large, sorted data sets			3	<b>OR</b>	What will be displayed after executing the following statements? <table border="1" data-bbox="868 470 1339 766"> <thead> <tr> <th>Python Statements</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>x = ["apple", "banana", "mango"] print(type(x))</td> <td></td> </tr> <tr> <td>x = "Hello World" print(type(x))</td> <td></td> </tr> <tr> <td>x = 20.5 print(type(x))</td> <td></td> </tr> </tbody> </table> a.	Python Statements	Output	x = ["apple", "banana", "mango"] print(type(x))		x = "Hello World" print(type(x))		x = 20.5 print(type(x))		3
Scenario	Search algorithm	Reason																							
Bounded data ranges																									
Small data sets																									
Large, sorted data sets																									
Python Statements	Output																								
x = ["apple", "banana", "mango"] print(type(x))																									
x = "Hello World" print(type(x))																									
x = 20.5 print(type(x))																									
viii.	Evaluate the following expression using the correct order of operations in Python: $(2 + 3 ** 2 + 4 // 2 * 5 \% 3 - 1) * 2$	3	<b>OR</b>	Draw OR and NAND gates with their truth table.	1.5+ 1.5																				
ix.	Write down any three advantages of infographics.	3	<b>OR</b>	List down any three tools to create a prototype.	3																				
x.	Convert the following Boolean expression to the logic circuit: $F = XYZ + X\bar{Y}Z + \bar{X}Z$	3	<b>OR</b>	Write a Python program that takes an alphabet as input and prints whether it is a vowel or a consonant.	3																				
xi.	What are the common applications of simulation that benefit everyday activities? (Provide any three applications)	3	<b>OR</b>	What is the impact of the digital divide on connectivity? What strategies should be taken to bridge the digital divide? (Give any two)	1+2																				
xii.	How logic gates are useful in daily life? Give any three applications.	3	<b>OR</b>	What is the difference between correlation and causation? Illustrate with example.	3																				
xiii.	Complete the following Python code that exits when x is "Physics". subjects = ["Computer", "English", "Physics"] for x in _____: if x == _____: _____	3	<b>OR</b>	Write a Python function <b>find_max()</b> that takes two numbers as input and returns the maximum number.	3																				
xiv.	Why does feasibility study an essential step in SDLC? In what ways can a technical feasibility study help identify challenges related to the infrastructure, or compatibility requirements of a software project?	1+2	<b>OR</b>	Identify the following statements as parameter or statistics: a. The average height of all students in your entire school. b. The average height of students in your class. c. The average score in a mathematics test for students in your class at your college d. The average score in a mathematics test for all students in your city. e. The standard deviation of the ages of 50 employees randomly selected from the corporation. f. The standard deviation of the ages of all employees in a large corporation	0.5x 6																				

## SECTION – C (Marks 20)

**Note:** Attempt all questions. Marks of each question are given.

(4 x 05=20)

Q. No.	Question	Marks	Question	Marks									
Q.3	<p>Simplify the Boolean Function F, using Karnaugh Map.</p> $F = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$ <p>Also construct logic circuit for the simplified expression.</p>	2.5+ 2.5	<b>OR</b>	<p>Write a Python program to compute the area of circle and rectangle by using function.</p>	5								
Q.4	<p>What are data collection methods? Contrast any two data collection methods with respect to strength, weakness, reliability, and validity.</p>	1+4	<b>OR</b>	<p>What is encryption? Compare Symmetric and Asymmetric encryption with respect to efficiency, security, key length, and large data handling.</p>	1+4								
Q.5	<p>Sort the following numbers in ascending order using Bubble sort algorithm:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px 10px;">10</td> <td style="padding: 2px 10px;">9</td> <td style="padding: 2px 10px;">26</td> <td style="padding: 2px 10px;">4</td> <td style="padding: 2px 10px;">1</td> <td style="padding: 2px 10px;">8</td> <td style="padding: 2px 10px;">37</td> <td style="padding: 2px 10px;">5</td> </tr> </table>	10	9	26	4	1	8	37	5	5	<b>OR</b>	<p>Write a Python program to count even and odd numbers in a list by using while loop.</p>	5
10	9	26	4	1	8	37	5						
Q.6	<p>What is blockchain technology? Explain any two technologies that enabled blockchain.</p>	1+4	<b>OR</b>	<p>What is reliable information source? Explain any four sources of reliable information.</p>	1+4								

Federal Board HSSC-I Examination  
**Computer Science Model Question Paper**

(Curriculum 2022-23)

**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: Q1(i)	Domain 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.)	K	1
2	A: Q1(ii)	Domain B	[SLO CS-11-B-02] Apply common search, and sort algorithms	K	1
3	A: Q1(iii)	Domain A	[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	K	1
4	A: Q1(iv)	Domain 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.	U	1
5	A: Q1(v)	Domain 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	1
6	A: Q1(vi)	Domain C	[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.	K	1
7	A: Q1(vii)	Domain B	[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	U	1
8	A: Q1(viii)	Domain 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)	K	1
9	A: Q1(ix)	Domain 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	1
10	A: Q1(x)	Domain H	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	U	1
11	A: Q1(xi)	Domain 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	1
12	A: Q1(xii)	Domain C	[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.	U	1



13	A: Q1(xiii)	Domain H		[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea		U	1
<b>Section B and C</b>							
14	B: Q2(i)	Domain C	<b>OR</b> Domain B	[SLO CS-11-C07] Students will determine ways of debugging their code in Python	<b>OR</b> [SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.	U	3
15	B: Q2(ii)	Domain D	<b>OR</b> Domain E	[SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications	<b>OR</b> [SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	K	3
16	B: Q2(iii)	Domain A	<b>OR</b> Domain D	[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.	<b>OR</b> [SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications	U	3
17	B: Q2(iv)	Domain H	<b>OR</b> Domain A	[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea	<b>OR</b> [SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems via network topology	U	3
18	B: Q2(v)	Domain C	<b>OR</b> Domain A	[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	<b>OR</b> [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	3

19	B: Q(vi)	Domain F	<b>OR</b> Domain E	<b>[SLO CS-11-F-02]</b> Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity	<b>OR</b> <b>[SLO CS-11-E-02]</b> Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs	K	3
20	B: Q(vii)	Domain B	<b>OR</b> Domain C	<b>[SLO CS-11-B-02]</b> Apply common search, and sort algorithms	<b>OR</b> <b>[SLO CS-11-C-02]</b> Students should be able to write and execute simple programs in Python	U	3
21	B: Q(viii)	Domain C	<b>OR</b> Domain A	<b>[SLO CS-11-C-02]</b> Students should be able to write and execute simple programs in Python.	<b>OR</b> <b>[SLO CS-11-A-01]</b> 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.	U	3
22	B: Q(ix)	Domain G	<b>OR</b> Domain H	<b>[SLO CS-11-G-01]</b> Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	<b>OR</b> <b>[SLO EN-11-H-01]</b> Students will create, test, and iterate a prototype for a business idea	K	3
23	B: Q(x)	Domain A	<b>OR</b> Domain C	<b>[SLO CS-11-A-01]</b> 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.	<b>OR</b> <b>[SLO CS-11-C-06]</b> Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	A	3

24	B: Q(xi)	Domain G	<b>OR</b> Domain F	<b>[SLO CS-11-G-01]</b> Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)	<b>OR</b> <b>[SLO CS-11-F-02]</b> Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity	K	3
25	B: Q(xii)	Domain A	<b>OR</b> Domain D	<b>[SLO CS-11-A-01]</b> 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.	<b>OR</b> <b>[SLO CS-11-D-02]</b> Students will understand and explain experimental design in data science	U	3
26	B: Q(xiii)	Domain C	<b>OR</b> Domain C	<b>[SLO CS-11-C-05]</b> Students should be able to translate simple algorithms that use sequence and repetition in Python.	<b>OR</b> <b>[SLO CS-11-C-06]</b> Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	A	3
27	B: Q(xiv)	Domain A	<b>OR</b> Domain D	<b>[SLO CS-11-A-02]</b> 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.	<b>OR</b> <b>[SLO CS-11-D-02]</b> Students will understand and explain experimental design in data science	U	3
28	C: Q3	Domain A	<b>OR</b> Domain C	<b>[SLO CS-11-A-01]</b> 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.	<b>OR</b> <b>[SLO CS-11-C-06]</b> Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python	A	5

29	C: Q4	Domain D	<b>OR</b> Domain A	<b>[SLO CS-11-D-02]</b> Students will understand and explain experimental design in data science	<b>OR</b> <b>[SLO CS-11-A-04]</b> Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.	U	5
30	C: Q5	Domain B	<b>OR</b> Domain C	<b>[SLO CS-11-B-02]</b> Apply common search, and sort algorithms	<b>OR</b> <b>[SLO CS-11-C-05]</b> Students should be able to translate simple algorithms that use sequence and repetition in Python.	A	5
31	C: Q6	Domain E	<b>OR</b> Domain F	<b>[SLO CS-11-E-01]</b> Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain	<b>OR</b> <b>[SLO CS-11-F-01]</b> Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to	K	5

\*Cognitive Level

K: Knowledge

U: Understanding

A: Application

## Table of Specification

### Model Paper Computer Science – Grade XI (HSSC-I)

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 levels
Cognitive Level										
Knowledge	Q1(iii)1	Q1(ii)1	Q1(vi)1	Q1(i)1 Q1(viii)1 Q2(ii/f)3	Q1(ix)1 Q2(ii/s)3 Q2(vi/s)3 Q6(f)5	Q2(vi/f)3 Q2(xi/s)3 Q6(s)5	Q2(ix/f)3 Q2(xi/f)3	Q2(ix/s)3	40	<b>29.2%</b>
Understanding	Q1(iv)1 Q2(iii/f)3 Q2(iv/s)3 Q2(v/s)3 Q2(viii/s)3 Q2(xii/f)3 Q2(xiv/f)3 Q4(s)5	Q1(vii)1 Q2(i/s)3 Q2(vii/f)3	Q1(xii)1 Q2(i/f)3 Q2(v/f)3 Q2(vii/s)3 Q2(viii/f)3	Q2(iii/s)3 Q2(xii/s)3 Q2(xiv/s)3 Q4(f)5		Q1(xi)1	Q1(v)1	Q1(x)1 Q1(xiii)1 Q2(iv/f)3	65	<b>47.4%</b>
Application	Q2(x/f)3 Q3(f)5	Q5(f)5	Q2(x/s)3 Q2(xiii/f)3 Q2(xiii/s)3 Q3(s)5 Q5(s)5				-		32	<b>23.4%</b>
Total Marks	33	13	33	19	12	12	7	8	137	-
Total Percentages	24.1	9.5	24.1	13.9	8.8	8.8	5.1	5.8	-	<b>100%</b>

**Note:**

- 1 This ToS does not reflect policy, but it is particular to this model question paper.
- 2 Proportionate / equitable representation of the content areas as per the defined ranges may be ensured.
- 3 The percentage of cognitive level is 30%, 50%, and 20% for knowledge, understanding, and application, respectively with  $\pm 5\%$  variation.
- 4 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:** Question Number (part/ first choice) marks                      example: **Q2 ( i / f ) 2**  
 Question Number (part/ second choice) marks                      example: **Q2 ( i / s ) 2**



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