



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

Secondary School Certificate  
Examination Syllabus

# Computer Science

Grades IX - X

(Based on New National Curriculum 2022-2023)

# Student Learning Outcomes of AKU-EB SSC Computer Science

## Part II (Grade X)

Topics and Subtopics	Student Learning Outcomes	Cognitive Level <sup>3</sup>		
		R	U	A and beyond
<b>8. Number Systems and Encoding Schemes</b>	Students should be able to:			
8.1 Number Systems	8.1.1 describe the number system and its following types in computers: a. decimal (denary), b. binary, c. hexadecimal;		*	
	8.1.2 describe the uses of number systems and their significance in computing;		*	
	8.1.3 convert numbers between binary, decimal (denary), and hexadecimal systems accurately using conversion methods;			A
8.3 Binary Arithmetic: Addition, Subtraction, Multiplication and Division	8.3.1 apply the binary number system to solve arithmetic problems involving addition, subtraction, multiplication, and division;			A
	8.3.2 determine 1's and 2's complement of binary numbers;			A
8.4 Encoding Data Scheme Representation	8.4.1 explain the following types of coding schemes to represent data: a. ASCII, b. Unicode;		*	

<sup>3</sup> R = Remember, U = Understand, A = Apply and beyond [Apply (A), Analyse (An), Evaluate (E), Create (C)]

Topics and Subtopics	Student Learning Outcomes	Cognitive Level		
		R	U	A and beyond
8.5 Introduction to Operating System	8.5.1 define Operating System (OS); 8.5.2 describe the functions of the following OS: a. memory management, b. I/ O management, c. file management, d. resource management, e. user management, f. process management;	*	*	
8.6 Classification and Types of Operating System	8.6.1 classify OS into single-user and multiuser OS; 8.6.2 differentiate among the following types of OS: a. batch processing system, b. time-sharing system, c. real-time system; 8.6.3 explain the following types of user interfaces provided by OS: a. Command Line Interface (CLI), e.g., DOS and UNIX, b. Menu Driven Interface (MDI), e.g., Novel c. Graphical User Interface (GUI), e.g., Macintosh, Linux and Windows;		*	
8.7 Interrupts and Buffers	8.7.1 define the following terms: a. interrupts, b. buffers; 8.7.2 differentiate between process and threads;	*	*	
8.8 Integrated Development Environment (IDE) Software	8.8.1 explain Integrated Development Environment (IDE) and its following features: a. code editor, b. translator, c. debugger, d. loader, e. linker.		*	

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level			
		R	U	A and beyond	
<b>9. Computational Thinking and Algorithm</b>	Students should be able to:				
9.1 Algorithm and Flowchart	9.1.1	write algorithms to address the following types of problems: a. conditional algorithm: I. if, II. nested if, III. if else, IV. else if, V. switch, b. iteration algorithm: I. for, II. while, III. do-while, IV. nested loops, c. searching algorithm: I. linear, II. binary, d. sorting algorithm: I. selection, II. bubble;			A
	9.1.2	draw flowcharts related to SLO # 9.1.1.			A

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			R	U	A and beyond
<b>10. Programming in JavaScript</b>	Students should be able to:				
10.1 Introduction to Programming Languages	10.1.1	differentiate between program syntax and program semantics;		*	
	10.1.2	describe the following programming languages: a. low-level languages: I. machine language, II. assembly language, b. high-level languages: I. procedural language, II. structured language, III. object-oriented language;		*	
	10.1.3	differentiate among an assembler, compiler and an interpreter;		*	
10.2 Input and Output Functions in JavaScript	10.2.1	apply the following functions to display the output: a. innerHTML, b. document.write( ), c. window.alert( );			A
	10.2.2	write a JavaScript code containing the following data types: a. String, b. Number, c. BigInt, d. Boolean, e. Undefined, f. Null;			A
	10.2.3	write a JavaScript code that uses input functions prompt( );			A

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level			
		R	U	A and beyond	
10.3 Operators in JavaScript	10.3.1	write a JavaScript program to solve arithmetic problems by using arithmetic operators;			A
	10.3.2	use the following assignment operators in a JavaScript code: a. assignment operator (=), b. compound assignment operator (+ =, - =, * =, / =, % =);			A
	10.3.3	use the increment (++) and decrement (--) operators in a JavaScript code;			A
	10.3.4	use the following relational operators in a JavaScript code: a. less than (<), b. greater than (>), c. less than or equal to (<=), d. greater than or equal to (>=), e. equal to (==), f. strict equal to (equal value and equal type) (===), g. not equal to (!=), h. strict not equal to (not equal value and not equal type) (!==);			A
	10.3.5	use the following logical operators in a JavaScript code: a. AND (&&), b. OR (  ), c. NOT (!);			A
	10.3.6	differentiate among the assignment operator (=), equal to operator (==) and identity operator (===);		*	
	10.3.7	use the conditional (ternary) operator in a JavaScript code;			A
	10.3.8	simplify an expression by using the order of precedence of operators;			A

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		R	U	A and beyond
10.4 Conditional Control Structure	10.4.1		*	
	10.4.2		*	
	10.4.3			A
	10.4.7		*	
10.5 Loop Structure	10.5.1		*	
	10.5.2		*	
	10.5.3			A
	10.5.4			A
	10.5.5			A

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		R	U	A and beyond
10.6 Introduction to Arrays	10.6.1		*	
	10.6.2			A
	10.6.3			A
	10.6.4			A

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Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			R	U	A and beyond
<b>11. Data and Analysis</b>	Students should be able to:				
11.1 Scope of Artificial Intelligence	11.1.1	explain Artificial Intelligence (AI) and its applications in modern technology;		*	An
	11.1.2	analyse the impact, scope, and emerging trends of Artificial Intelligence (AI) in the following fields: a. AI engineering, b. robotics, c. military and aviation, d. mechanical engineering, e. AI-assisted surgery;			
11.2 Scope of Machine Learning	11.2.1	explain the following machine-learning skills: a. AI-enabled systems learning from large data, b. supervised and unsupervised learning, c. automation and scalability, d. fraud detection;		*	A A
	11.2.2	use data mining techniques to extract patterns and insights from given datasets for real-world applications;			
	11.2.3	apply Natural Language Processing (NLP) concepts in real-world applications like speech recognition, translation, and text analysis;			
11.3 Big Data and Applications of Big Data in Real-World Business	11.3.1	explain the big data concept and its significance in managing and reviewing large datasets;		*	A An
	11.3.2	explain the following big data analysis methods: a. descriptive analytics, b. diagnostic analytics, c. predictive analytics, d. prescriptive analytics;		*	
	11.3.3	illustrate the real-world business applications in big data;			
	11.3.4	analyse datasets to extract insights in various domains;			

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		R	U	A and beyond
<b>12. Security, Privacy and Data Integrity</b>	Students should be able to:			
12.1 Safe and Responsible Use of Information Sources	12.1.1 describe information literacy and its importance; 12.1.2 explain the essentials of good digital citizenship (safe and responsible use of technology); 12.1.3 explain key concepts of copyright, plagiarism, and piracy; 12.1.4 analyse ethical issues that arise in ICT while navigating online environments; 12.1.5 assess the importance of online safety, responsibility and respectfulness; 12.1.6 examine the health concerns associated with the excessive use of ICT devices and their impact on well-being; 12.1.7 assess the significance of maintaining online safety, demonstrating responsible digital behaviour, and fostering respectful communication in digital spaces;		* * *	An E An E
12.2 Cyberbullying and Harassment	12.2.1 describe cyberbullying; 12.2.2 analyse the impacts of cyberbullying on students; 12.2.3 suggest effective strategies to prevent cyberbullying and promote responsible digital behaviour;		*	An E

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		R	U	A and beyond
12.3 The Digital Divide	12.3.1 describe the digital divide and its following types: a. access divide, b. skill divide, c. income divide, d. geographical divide, e. cultural divide;		*	
	12.3.2 explain the following causes of the digital divide: a. economical, b. geographical, c. educational, d. social and cultural, e. government policies;		*	
	12.3.3 explain the following effects of the digital divide: a. unequal access to information, b. education gap, c. economic disadvantage, d. social isolation, e. health disparities, f. democratic participation;		*	
	12.3.4 recommend strategies to reduce the digital divide and improve digital accessibility.			E

Topics and Sub-topics	Student Learning Outcomes		Cognitive Level		
			R	U	A and beyond
<b>13. Digital Literacy</b>	Students should be able to:				
13.1 Digital Literacy and Tools of Digital Technology	13.1.1	differentiate between digital literacy and digital technology;		*	A
	13.1.2	apply digital technology tools to improve communication, security, and problem-solving in daily life;			E
	13.1.3	evaluate the effectiveness of digital technologies in different real-life scenarios to optimise productivity and connectivity;			
13.2 Digital Artefact Design and Development	13.2.1	explain digital artefacts;		*	FA <sup>4</sup>
	13.2.2	use the following digital tools in real-world tasks by applying digital literacy and creativity: <ul style="list-style-type: none"> <li>a. Canva for graphic designing,</li> <li>b. Scratch for coding,</li> <li>c. Microsoft PowerPoint for creating presentations,</li> <li>d. Microsoft Excel for entering data or calculations,</li> <li>e. Microsoft Word for formatting text or using templates;</li> </ul>			
	13.2.3	explore simple information gathering using online resources and digital libraries.			FA

<sup>4</sup>FA= Formative Assessment, not to be assessed under examination conditions

Topics and Sub-topics	Student Learning Outcomes	Cognitive Level		
		R	U	A and beyond
<b>14. Entrepreneurship in the Digital Age</b>	Students should be able to:			
14.1 Digital Marketing Fundamentals	14.1.1		*	
	14.1.2		*	
	14.1.3		*	
		a. executive summary, b. startup, c. analyse the market, d. enlist products/ services, e. target market, f. promotional strategy, g. budget;		
	14.1.4	suggest digital marketing strategies to promote products, services, or ideas effectively;		E
	14.1.5	construct a business plan for a product or service based on your community or global needs;		FA
14.2 Digital Tools to Conduct Research Surveys and Questionnaires	14.2.1	design customisable surveys and questionnaires to gather insights for developing a business idea (e.g., google forms, survey monkey).		FA

Part II (Grade X)

S.No	Practical Activity	Equipment	Software
<b>Topic 10: Programming in JavaScript</b>			
1.	Apply output functions: innerHTML, document.write( ) and window.alert( ) to display the output;	Computer	Notepad and Browser
2.	Write a JavaScript code containing the following data types: <ol style="list-style-type: none"> <li>a. String,</li> <li>b. Number,</li> <li>c. BigInt,</li> <li>d. Boolean,</li> <li>e. Undefined,</li> <li>f. Null;</li> </ol>		
3.	Write a JavaScript code that uses input functions prompt();		
4.	Convert arithmetic expression into JavaScript code;		
5.	Use the arithmetic operators of JavaScript to solve an arithmetic problem;		
6.	Use the increment (++) and decrement (--) operators in a JavaScript code;		
7.	Use the following relational operators in a JavaScript code: <ol style="list-style-type: none"> <li>a. less than (&lt;),</li> <li>b. greater than (&gt;),</li> <li>c. less than or equal to (&lt;=),</li> <li>d. greater than or equal to (&gt;=),</li> <li>e. equal to (==),</li> <li>f. strict equal to (equal value and equal type) (===),</li> <li>g. not equal to (!=);</li> <li>h. strict not equal to (not equal value and not equal type) (!==);</li> </ol>		

8.	Write JavaScript code to implement if statement;		
9.	Write JavaScript code to implement if-else statement;		
10.	Write JavaScript code for nested if-else or if-else-if statement;		
11.	Write JavaScript code for switch statement;		
12.	Write JavaScript code to implement for loop;		
13.	Write JavaScript code for while loop;		
14.	Write JavaScript code for do while loop;		
15.	Write the output of a given program having loop and selection structures;		
16.	Use break and continue statements in a JavaScript code;		
17.	Write JavaScript codes for nested loop;		

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## Annexure A: List of Acronyms and Their Full Forms

Acronym	Full Form
2FA	Two-Factor Authentication
AI	Artificial Intelligence
ASCII	American Standard Code for Information Interchange
BCR	Barcode Reader
BMC	Business Model Canvas
CD	Compact Disc
CLI	Command Line Interface
CPU	Central Processing Unit
CSS	Cascading Style Sheets
DoS	Denial of Services
DDoS	Distributed Denial of Services
DOS	Disc Operating System
DSL	Digital Subscriber Line
DVD	Digital Versatile Disc
DVD RAM	Digital Versatile Disc Random Access Memory
FTP	File Transfer Protocol
GiB	Gibibyte
Gb	Gigabit
GB	Gigabyte
GUI	Graphical User Interface
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
HDD	Hard Disk Drive
I/ O	Input/ Output
IoT	Internet of Things
ICT	Information Communication Technology
IDE	Integrated Development Environment
ISDN	Integrated Services Digital Network
IT	Information Technology

KiB	Kibibyte
Acronym	Full Form
Kb	Kilobit
KB	Kilobyte
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MAN	Metropolitan Area Network
MiB	Mebibyte
Mb	Megabit
MB	Megabyte
MDI	Menu Driven Interface
MICR	Magnetic Ink Character Reader
MFA	Multifactor Authentication
ML	Machine Learning
NIC	Network Interface Card
NLP	Natural Language Processing
OCR	Optical Character Recognition
OMR	Optical Mark Reader
OS	Operating System
OSI	Open System Interconnection
PIN	Personal Identification Number
RAM	Random Access Memory
ROM	Read Only Memory
SSD	Solid State Drive
TCP/ IP	Transmission Control Protocol/ Internet Protocol
UNIX (UNICS)	Uniplexed Information and Computing System
URL	Uniform Resource Locator
USB	Universal Serial Bus
WAN	Wide Area Network
WWW	World Wide Web

## **Annexure B: Sample Problems for Algorithms, Flowcharts and Programming**

1. Find the sum, product and average of five given numbers.
2. Find the acceleration of a moving object with a given mass and the force applied.
3. Find the volume of a cube, cylinder or sphere.
4. Find the area of a triangle, parallelogram, rhombus or trapezium.
5. Convert Celsius to Fahrenheit temperature and vice versa.
6. Prepare an electricity bill including number of units consumed, price per unit, government sales tax (GST) and total amount to be paid within due date and 10% surcharge after due date.
7. Display the larger one out of the three given unequal numbers.
8. Assign a grade to a subject based on the achieved marks.
9. Find the interest on an amount.
10. Determine whether a given number is prime or composite.
11. Generate a sequence of odd numbers starting from a given number.
12. Generate a sequence of even numbers starting from a given number.
13. Produce a multiplication table for a given number.

Table 2: Exam Specification

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
8.	Number Systems and Encoding Schemes	4	Total 3 Marks (1 CRQ)		7
9.	Computational Thinking and Algorithm	7	Total 3 Marks (1 CRQ)		10
10.	Programming in JavaScript	8	Total 7 Marks (3 CRQs)	6 Marks Choose any ONE from TWO	21
11.	Data and Analysis	4		6 Marks Choose any ONE from TWO	16
12.	Security, Privacy and Data Integrity	6			
13.	Digital Literacy	7		7	
14.	Entrepreneurship in the Digital Age	4			4
<b>Total</b>		<b>40</b>	<b>13</b>	<b>12</b>	<b>65</b>
<b>Practical</b>					<b>10</b>
<b>Total</b>					<b>75</b>

## Examination Structure and Practical Requirements for Grades IX and X

### Theory:

- Multiple Choice Question (MCQ) requires candidates to choose one best/ correct answer from four options for each question. Each MCQ carries ONE mark.
- Constructed Response Question (CRQ) requires students to respond with a short text (few phrases/ sentences), calculations or diagrams.
- Extended Response Question (ERQ) requires students to answer in a more descriptive form. The answer should be in paragraph form, with diagrams where needed, and address all parts of the question.
- Table 1 and 2 contain the marks distribution for each topic.
- There will be two examinations, one at the end of grade IX and one at the end of grade X.
- In each grade, the theory paper will be for 3 hours and will consist of two parts: paper I and paper II.
- Paper I theory will consist of 40 compulsory, multiple choice items. These questions will involve four response options. The answer sheet for paper I will be provided separately.
- Paper II theory will carry 25 marks and consist of Constructed Response Questions (CRQs) and Extended Response Questions (ERQs). Each extended response question will be presented in an either/ or form.
- The booklet for paper II will serve as an answer script.

### Practical:

- In each grade, a practical examination (Paper III) will be conducted separately from the theory paper and will consist of 10 marks.
- Practical examination (Paper III) will be based on the list of practical activities given in the examination syllabus. Schools may design their own practical manuals based on these activities for teaching and learning purposes.
- Practical journals/ portfolio should be developed by students and endorsed by a figure of authority, such as a teacher or principal, and submitted at the time of the practical examination (Paper III).
- It is essential for each school to equip its computer labs with the necessary software, hardware, peripherals, and other resources according to the requirements of the practical activities. Each school will be responsible for making sure that each student is provided with the opportunity to do the practical activities.