PEPERIKSAAN
SIJIL TINGGI PERSEKOLAHAN MALAYSIA
(*MALAYSIA HIGHER SCHOOL CERTIFICATE*)

COMPUTING
Syllabus and Specimen Papers

This syllabus applies for the 2003 examination and thereafter until further notice. Teachers/candidates are advised to contact Majlis Peperiksaan Malaysia for the latest information about the syllabus.

MAJLIS PEPERIKSAAN MALAYSIA
(*MALAYSIAN EXAMINATION COUNCIL)*

FOREWORD

This new Computing syllabus replaces the old Computing syllabus which has been in use since the Malaysia Higher School Certificate examination in 1998. This new syllabus will be introduced in lower six in the year 2002 and the first examination based on this syllabus will be held in the year 2003. The aims, objectives, content, form of examination, and specimen papers for this subject are presented in this booklet.

The Computing syllabus for the Malaysia Higher School Certificate examination has to be reviewed and rewritten so that its content is in line with current developments in the field of information and communication technology. Topics in the old syllabus which are no longer suitable for preuniversity education have been replaced while others are maintained or reviewed. Topics which are prerequisite for students at this level, for example systems analysis and design as well as multimedia, have been included in the new syllabus.

The Computing syllabus comprises a detailed explanation of the content in the form of desired learning outcomes to be demonstrated by students after they have studied each subtopic. It is hoped that teachers and students will obtain a clear understanding of the depth and scope of the syllabus content.

The examination format of this subject has been slightly modified. Two examination papers, Paper 1 and Paper 2, are presented in the form of essay-type questions so that cognitive skills at the application level can be evaluated at a greater extent. Paper 3 will be in the form of coursework which will be assessed by the school. This coursework replaces the computing project in the old syllabus. It is hoped that the practical aspect will make the subject more interesting and appealing for students and will not burden them.

The syllabus has been reviewed with the hope that the Malaysia Higher School Certificate Computing subject will be taken up not only by the science .and technology stream students but also the social sciences and management stream students.

On behalf of Malaysian Examinations Council, I would like to thank the Malaysia Higher School Certificate Computing Syllabus Committee chaired by the Honourable Prof Dr Tengku Mohd bin Tengku Sembok from Universiti Kebangsaan Malaysia and all others who have contributed towards the development of the syllabus. It is hoped that the syllabus will achieve its aims.

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SYLLABUS

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Aims

The Computing syllabus aims to develop the basic knowledge of information and communication technology and strong skills in programming, information system development, and multimedia development among students to enable them to further their studies at institutions of higher learning in various areas, especially those related to information and communication technology, or to help them embark on a related career.

Objectives

The objectives of this syllabus are to enable students to

(*a*)   understand the development and use of information technology in various areas and its impact on society;

(*b*)   understand the ethical and security issues in the use of information technology;

(*c*)   understand the basic concept of computer and communication technology;

(*d*)   understand the basis of construction of algorithms and acquire skills in programming to solve problems using computers;

(*e*)   understand the principle of information systems development and acquire skills in systems analysis and design as well as skills in database design;

(*f*)   understand the concept and components of multimedia and acquire skills in multimedia applications development;

(*g*)   acquire skills in the use of database management system software, multimedia software, and structured programming language.

Content

1.   Information and Communication Technology (*40 theory periods*)

The objective of this topic is to provide students with an understanding of the development and use of information technology in various areas such as commerce, management, education, manufacturing, and creativity.

Students will study the impact of the use of information technology on individuals, organisations, and society. The awareness of ethics, security and privacy, health issues, and environmental friendly issues in the use of information technology are also emphasised in this topic.

Students' understanding of the basic concept of computer and communication technology will be strengthened with the study of computer systems, operating systems, data communication, computer networks, and the Internet.

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*The Computing subject can only be taken by candidates from the government or private schools which have been given permission by the Malaysian Examinations Council to offer this subject.

1.1   Development of lnformation Technology (*4 theory periods*)

1.1.1   Meaning of information technology
1.1.2   Components of information technology
1.1.3   Development of information technology
1.1.4   Contributions and motivations of individuals and organisations

Explanatory notes

Candidates should be able to

(*a*)   distinguish between data, information, and knowledge;

(*b*)   explain the meaning of information technology and the components of information technology;

(*c*)   distinguish the types of computers;

(*d*)   distinguish between systems software and applications software;

(*e*)   distinguish between copyrighted software, shareware, groupware, freeware, and suite software;

(*f*)   discuss the requirements and uses of software packages such as word-processing packages, electronic spreadsheets, databases, and graphics packages;

(*g*)   describe the development of information technology, ie the development of hardware, software, telecommunication and networking, and the Internet;

(*h*)   describe the generations of computer from the first generation to the latest generation;

(*i*)   describe the development of systems software and applications software until today;

(*j*)   distinguish between stand alone computers, computer networks, and the Internet;

(*k*)   distinguish between centralised processing and distributed processing;

(*1*)   distinguish between wired communication and wireless communication;

(*m*)   describe the contributions and motivations of individuals and organisations towards the development of information technology.

1.2   Computer Technology (*12 theory periods*)

1.2.1   Data representation
1.2.2   Computer system components
1.2.3   Central processing unit and memory
1.2.4   Secondary storage
1.2.5   Input/output devices
1.2.6   Operating systems

Explanatory notes

Candidates should be able to

(*a*)   understand binary, octal, and hexadecimal systems;

(*b*)   express numbers in binary, octal, and hexadecimal;

(*c*)   explain methods of data representation in the computer;

(*d*)   explain bit, byte, and word;

(*e*)   explain the use of codes such as ASCII, BCD, EBCDIC, and Unicode to represent a character set;

(*f*)   draw the block diagram of the components of a computer;

(*g*)   explain the function of each component of a computer system and the relationship between one component and another;

(*h*)   understand the functions of the central processing unit (CPU) components: control unit, arithmetic logic unit (ALU), register, and bus;

(*i*)   explain the machine cycle;

(*j*)   explain the function of memory;

(*k*)   distinguish the types of memory, eg RAM, ROM, PROM, EPROM, EAROM, SRAM, DRAM, and SDRAM;

(*l*)   distinguish between secondary storage and memory (primary storage);

(*m*)   describe the advantages of secondary storage compared to memory;

(*n*)   describe the types of secondary storage, eg diskette, hard disk, optical disk (CD-ROM, CD-I, CD-R, CD-RW, and DVD-ROM), and magnetic tape;

(*o*)   explain the types and functions of input devices, eg keyboard, mouse, light pen, joystick, track ball, scanner, touch screen, digital camera, microphone, character reader (MICR, OMR, OCR), and smart card;

(*p*)   explain the types and functions of output devices, eg screen, loudspeaker, printer, and plotter;

(*q*)   distinguish the functions of input/output devices;

(*r*)   explain the functions of operating systems: resource allocation, resource scheduling, memory management, input/output control, interrupt operation, file management, and interface;

(*s*)   recognise the brands of operating systems, eg Windows, MS-DOS, Mac OS, Unix, Linux, and OS/2, and recognise the computer platform on which the operating system can be run.

1.3   Communication Technology (*12 theory periods*)

1.3.1   Data communication
1.3.2   Computer network
1.3.3   Internet

Explanatory notes

Candidates should be able to

(*a*)   state the components of data communication: sender, receiver, medium, message, and protocol;

(*b*)   explain the meaning of sender, receiver, medium, message, and protocol;

(*c*)   explain the transmission media, ie telephone line, coaxial cable, twisted pair cable (STP and UTP), fibre optic cable, and atmosphere, in terms of speed and distance limit;

(*d*)   explain the meaning of bandwidth and its effect on the speed of data transmission;

(*e*)   explain the connection between message and signal;

(*f*)   state the types of signal: analogue and digital;

(*g*)   explain the forms of signal: electric, light, radiowave, microwave, and infrared;

(*h*)   explain the connection between transmission media and the types of signal;

(*i*)   distinguish the transmission modes: simplex, half duplex, and full duplex;

(*j*)   understand the concept and use of computer networks;

(*k*)   explain the configuration concepts of point-to-point line and multipoint line;

(*l*)   state the advantages and disadvantages of each line configuration;

(*m*)   understand peer-to-peer network and client-server system;

(*n*)   describe the architecture of centralised processing system and its components: host computer and remote terminal;

(*o*)   describe the architecture of distributed processing system and its components: node, client, server, and host computer;

(*p*)   distinguish the categories of networks, ie LAN, MAN, WAN, and Internet, in terms of suitability, coverage, and configuration;

(*q*)   distinguish LAN topologies: star, bus, and ring;

(*r*)   explain the difference between internet and Internet;

(*s*)   distinguish between internet, intranet, and extranet;

(*t*)   explain the purpose of Internet popular services: FfP, HTTP, Telnet, Ping, IRC, and e-mail.

1.4   Information Technology Applications (*8 theory periods*)

1.4.1   Commerce areas
1.4.2   Management areas
1.4.3   Education areas
1.4.4   Manufacturing areas
1.4.5   Transportation areas
1.4.6   Control system and embedded system areas
1.4.7   Creativity areas

Explanatory notes

Candidates should be able to

(*a*)   understand various information technology applications in each of the following areas:

    (i)   Commerce areas: banking, electronic commerce

    (ii)   Management areas: office automation, management information system, electronic government

    (iii)   Education areas: computer aided instruction, computer-based learning, distance learning

    (iv)   Manufacturing areas: computer aided manufacture, vehicle assembly system

    (v)   Transportation areas: automatic toll payment system, ticket reservation system

    (vi)   Control system and embedded system areas: home appliances, patient monitoring system, house control system

    (vii)   Creativity areas: computer games, animation, advertisement

    Note: Candidates need not have the specific knowledge of each application type, but should be able to comment logically any proposed application with the use of specific relevant examples.

(*b*)   describe an example of information technology application in each area listed in (*a*) above from the following aspects:

    (i)   The purpose of the application

    (ii)   The outcome of the application

(iii) The requirements of systems hardware, software, and communication

(iv) Input data and methods of inputting data

(v) The need for recovery in the event of a system failure

(vi) The interface between the system and its users

(vii) The effectiveness of the system in practice

(viii) Effects and implications of the application on individuals/organisations/society

1.5 Security and Privacy (*2 theory periods*)

1.5.1 Security and privacy issues
1.5.2 Types of security threat
1.5.3 Physical control
1.5.4 Procedural control
1.5.5 Information system control

Explanatory notes

Candidates should be able to

(*a*) explain the security and privacy issues;

(*b*) describe the types of threat to computer system security and data/information integrity, eg viruses, natural disasters, and computer crime;

(*c*) describe the physical control steps, eg security control, key, smart card, and fire resistance   room, to guarantee the security and reliability of computer systems and data integrity;

(*d*) describe the steps of procedural control, eg work distribution, standards and documentation, permjssion, law, disaster recovery, and physical dependency, to guarantee the security and reliability of computer systems and data integrity;

(*e*) describe the steps of information system control, eg input control, processing control, hardware control, output control, and storage control, to guarantee the security and reliability of computer systems and data integrity;

(*f*) explain the effects of the failure of physical control, procedural control, and information system control steps.

1.6 Information Technology Ethics and Issues (*2 theory periods*)

1.6.1 Ethics of the use of information technology
1.6.2 Health issues
1.6.3 Environmental friendly issues

Explanatory notes

Candidates should be able to

(*a*) explain the ethics of the use of information technology as a method to protect the security and privacy, including topics related to information, ie privacy, accuracy, ownership, and accessibility;

(*b*) explain the health risks, eg nape pain, eye strain, and repetitive strain injury (RSQ, as a result of using computers;

(*c*) explain the ergonomics steps to avoid the health risks and increase productivity, eg keyboard design, monitor screen filters, computer tables, and computer chairs;

(*d*)   describe the steps or methods to prepare naturally friendly environment in the use of information technology, eg recycling, green computers, and electrical energy saving (energy star programme).

2.   Information System Development (*106 theory and 54 practical periods*)

The objective of this topic is to develop students' skills in the information system development by giving emphasis to systems analysis and design and database development.

Systems analysis and design cover the methods of planning, analysis, design, implementation, and systems maintenance. Database development covers data modeling, data normalisation, and data manipulation. Students' skills in the use of a database management system will be developed by giving emphasis to table construction, data manipulation using structured query language, and report generation.

Students' skills in information system development will be developed further by completing given assignments and writing systems report.

2.1   Introduction to Systems Analysis and Design (*6 theory periods*)

    2.1.1   System development environment
    2.1.2   Personnels in system development
    2.1.3   Types of information system
    2.1.4   Information system development

Explanatory notes

Candidates should be able to

(*a*)   state the aims of systems analysis and design;

(*b*)   explain the relationship between manual working systems, computerised systems, systems analysis and design, and system analysts;

(*c*)   describe the duties and responsibilities of personnels in system development, eg information system managers; system analysts, programmers, and end users;

(*d*)   describe the uses and differences between types of information systems: transaction processing systems, management information systems, decision support systems, and expert systems;

(*e*)   state some system development methodologies, eg waterfall model, rapid application development model, and evolution model;

(*f*)   describe the main phases in system development life cycle, ie planning, analysis, design, implementation, and maintenance, with reference to the waterfall model.

2.2   Planning Phase (*2 theory periods*)

    2.2.1   Aims, activities, and outcome of planning phase
    2.2.2   Feasibility study

Explanatory notes

Candidates should be able to

(*a*)   state the aims, activities, and desired outcome in the planning phase;

(*b*)   describe the activities performed in the planning phase: initial evaluation and feasibility study.

2.3 **Analysis Phase** (*26 theory and 6 practical periods*)

    2.3.1   Determination of users' requirements
    2.3.2   Structuring of system requirements

Explanatory notes

Candidates should be able to

(*a*)   state the steps of analysis phase: determination of users' requirements and structuring of system requirements;

(*b*)   apply the methods of determining users' requirements such as interviewing and listening, giving questionnaires, making observations, and analysing procedures and documents;

(*c*)   state the suitable methods of determining users' requirements according to situations;

(*d*)   state the steps and results of structuring of system requirements: process modelling, logical modelling, and conceptual data modelling;

(*e*)   use data flow diagrams to model the solution processes;

(*j*)   use logical model representations, ie pseudocode or decision table, to model the solution logic;

(*g*)   use entity-relationship (E-R) diagrams to model conceptual data.

2.4 **Design Phase** (*18 theory and 8 practical periods*)

    2.4.1   Logical design
    2.4.2   Physical design
    2.4.3   Program structure design

Explanatory notes

Candidates should be able to

(*a*)   explain the steps and outcome of design phase: logical design, physical design, and program structure design;

(*b*)   design forms, reports, and system interfaces;

(*c*)   design program structures using structure charts.

2.5 **Implementation Phase** (*2 theory periods*)

    2.5.1   Steps of implementation phase
    2.5.2   Outcome of implementation phase

Explanatory notes

Candidates should be able to explain the steps and outcome of implementation phase: coding, testing, installation, evaluation, documentation, training, and support.

2.6 **Maintenance Phase** (*2 theory periods*)

    2.6.1   Steps of maintenance phase
    2.6.2   Outcome of maintenance phase

Explanatory notes

Candidates should be able to explain the steps and outcome of maintenance phase: maintenance demand, change mapping, change design, and change implementation.

2.7 Introduction to Databases (*6 theory periods*)

2.7.1   Data operation
2.7.2   Characteristics of data and information
2.7.3   Data hierarchy
2.7.4   File organisation

Explanatory notes

Candidates should be able to

(*a*)   explain the meaning of data and information;

(*b*)   explain the importance of data as an asset to organisations such as schools and hospitals;

(*c*)   explain the types of data operation, eg sorting, validation, and abstraction;

(*d*)   describe the characteristics of good data and information which can help users in making decisions;

(*e*)   explain the data hierarchy;

(*f*)   explain the organisation of sequential files, random files, and indexed files.

2.8 Basic Concept of Database (*14 theory periods*)

2.8.1   Basic terminologies
2.8.2   Use of database systems in Malaysia
2.8.3   Components of database system and database management system
2.8.4   Comparison between database system and file processing system
2.8.5   Development of database management system
2.8.6   Organisation of relational database
2.8.7   Administration of database system

Explanatory notes

Candidates should be able to

(*a*)   explain the meaning of basic terminologies such as database, database system, and database management system (DBMS);

(*b*)   discuss the use and importance of database system in various areas such as administration, business, and daily life;

(*c*)   discuss the use and importance of database system in centralised environment, distributed environment, client-server, and personal computers;

(*d*)   explain the importance of software, hardware, data, people, and procedure as integrated components of a database system;

(*e*)   explain the important components of DBMS including functions and aims: data dictionary, data manipulation language (DML), and data description language (DDL);

(*f*)   describe the advantages of database system as compared with file processing system;

(*g*)   describe the development and use of DBMS models (hierarchy, network, and relational) and relate them to the development of computer systems;

(*h*)   explain the concepts of table, row, and column as representations of a relational database;

(*i*)   explain the concept of key and identify the primary key;

(*j*)   explain the characteristics and mechanisms of database security and the concept of data integrity;

(*k*) explain the importance of effective database administration;

(*l*) state the duties and responsibilities of database administrators.

2.9   Planning and Design of Database System (*22 theory periods*)

2.9.1   Aims of database design
2.9.2   Data modelling
2.9.3   Data normalisation

Explanatory notes

Candidates should be able to

(*a*) explain the aims of good database design: to avoid data redundancy and data inconsistency and to obtain data independency and data abstraction;

(*b*) identify entity set, attribute, relational set, and cardinality in modelling a problem in a given scenario;

(*c*) use entity-relationship (E-R) diagrams to model data;

(*d*) map the E-R diagram to a relational model;

(*e*) explain the concepts of full functional dependency, partial functional dependency, and transitive functional dependency;

(*f*) normalise the database schema up to third normal form.

2.10   Query Language (*8 theory periods*)

2.10.1   Data manipulation
2.10.2   Data definition

Explanatory notes

Candidates should be able to

(*a*) use the structured query language (SQL) to implement basic data manipulation: adding and deleting data, updating data, arranging data, and retrieving information in the required form;

(*b*) use SQL to create tables and define views.

2.11   Implementation of Database Application System (*40 theory periods*)

2.11.1   Understanding problem statement
2.11.2   Modelling data
2.11.3   Normalising data
2.11.4   Implementing system

Explanatory notes

Candidates should be able to

(*a*) implement the planning phase and analysis phase (*refer to* 2.2 *and* 2.3)*;*

(*b*) draw E-R diagrams (*refer to 2.9*)*;*

(*c*) implement the data normalisation process (*refer to 2.9*)*;*

(*d*) implement the development of database application system using the window-based DBMS software on personal computers, eg MS Access, Lotus Approach, and Oracle RDBMS.

3. Multimedia (*22 theory and 12 practical periods*)

The objective of this topic is to develop students' understanding of the concept and development of multimedia applications by giving emphasis to multimedia elements, layout basic principles, hypertext, and hypermedia, as well as the characteristics of effective multimedia applications. Subsequently students will be provided with skills in the use multimedia software by giving emphasis to the combination of multimedia elements.

Students' skills in multimedia application development will be developed further by solving given assignments.

3.1 Multimedia Evolution (*2 theory periods*)

3.1.1 Multimedia applications
3.1.2 Multimedia impact

Explanatory notes

Candidates should be able to

(*a*) explain the meaning and importance of multimedia;

(*b*) discuss multimedia applications in certain areas, eg business, administration, entertainment, education, and virtual reality, by giving relevant examples;

(*c*) describe the current development and future trends of multimedia;

(*d*) discuss the impact of multimedia on society.

3.2 Multimedia Technology (*3 theory and 2 practical periods*)

3.2.1 Multimedia hardware
3.2.2 Multimedia software

Explanatory notes

Candidates should be able to

(*a*) explain the multimedia computer hardware and the function of each hardware;

(*b*) discuss the use of multimedia software, that is programming languages (eg Visual Basic and C++), authoring tools (eg Macromedia Director and Authorware), and editors according to the types of multimedia elements (eg Photoshop for graphics, Sound Forge for audio, Adobe Premier for video, and Flash for animation).

3.3 Multimedia Page (*10 theory periods*)

3.3.1 Multimedia elements
3.3.2 Basic principles of layout
3.3.3 Hypertext and hypermedia
3.3.4 Characteristics of effective multimedia applications

Explanatory notes

Candidates should be able to

(*a*) describe the multimedia elements: text, graphics, animation, audio, and video;

(*b*) explain the text attributes, eg typeface, size, style, and colour of font;

(*c*) distinguish between the types of graphics, eg stationary, moving, 2D, 3D, vector, bitmap, and resolution;

(*d*) explain the standard format of graphics files and specific use of each format, eg bmp, gif, tif, jpeg, pcx, and wpg;

(*e*) explain the concept of animation;

(*f*) explain audio in terms of types (MIDI, digital), sampling (Hz, dB, bit/sample, mono, and stereo), and file standard formats (au, wav, and mp3);

(*g*) explain the analog video standards (NTSC, PAL, SECAM), and the standard format of digital video recording (avi, mpeg, mov);

(*h*) explain the basic principle of a multimedia page layout which is suitable for presentation, web, and CD applications;

(*i*) explain the use of hypertext and hypermedia to obtain information;

(*j*) explain the characteristics of effective multimedia applications: suitability of multimedia elements, harmony of arrangement of multimedia elements, user-friendly interface, and content accuracy.

3.4 **Multimedia in Network** (*5 theory and 4 practical periods*)

3.4.1 Multimedia evolution
3.4.2 Multimedia applications in internet
3.4.3 World wide web
3.4.4 Internet programming languages

Explanatory notes

Candidates should be able to

(*a*) explain the evolution and use of multimedia from the early stage (video games) until network;

(*b*) explain the multimedia applications such as e-commerce, e-learning, video conferencing, education portal;

(*c*) explain world wide web (www);

(*d*) explain web browsers and types of plug-in to process documents, image, sound, animation, and video;

(*e*) explain internet programming languages such as Java (JDK, Cafe, and Borland), Visual Basic script, Java script, and HTML.

3.5 **Multimedia Development** (*2 theory and 6 practical periods*)

Explanatory notes

Candidates should be able to

(*a*) explain the steps in multimedia development: analysis, design, development, testing, correction and documentation, and delivery;

(*b*) develop effective and ethical multimedia applications using suitable hardware, software, and tools (eg storyboard).

Note: The multimedia product to be developed can be CD-based or web-based.

4.   Programming (*92 theory and 74 practical periods*)

The objective of this topic is to develop students' skills in solving problems using computers. Students will study the concepts and steps of problem solving, algorithm construction, and basic data types. Subsequently students will be provided with skills in algorithm coding using, a structured programming language, ie C language.

The characteristics of C language to be studied will cover declarative statements, operators, input, output, basic control structures, **struct,** and files as weII as the use of functions and arrays.

Students' skills in the use of C language wiII be developed further by solving some common problems in given assignments.

4.1   Steps of Problem Solving (*4 theory periods*)

    4.1.1   Problem analysis
    4.1.2   Solution design
    4.1.3   Implementation
    4.1.4   Testing and validation

Explanatory notes

Candidates should be able to

(*a*)   give examples of steps in solving daily problems, eg steps in making a cup of coffee;

(*b*)   explain steps of problem solving using a computer: problem analysis, solution design, implementation, and testing and validation.

4.2   Algorithm Construction (*8 theory periods*)

    4.2.1   Definition of algorithm
    4.2.2   Algorithm representations
    4.2.3   Algorithm control structures

Explanatory notes

Candidates should be able to

(*a*)   define algorithms;

(*b*)   explain two algorithm representations: pseudocode and flowchart;

(*c*)   distinguish the design of three types of algorithm control structures: sequential, selection, and repetition;

(*d*)   use suitable algorithm representations and algorithm control structures in constructing algorithms to solve problems.

4.3   Standard Algorithms (*8 theory periods*)

    4.3.1   Sorting
    4.3.2   Searching

Explanatory notes

Candidates should be able to

(*a*)   construct algorithms, eg obtain a total, a minimum, a maximum, and an average of a set of numbers;

(*b*)   use the methods of insertion sort and bubble sort;

(*c*)   use the method of linear search.

4.4 **Basic Data Types** (*4 theory periods*)

4.4.1   Scalar data
4.4.2   Structured data

Explanatory notes

Candidates should be able to

(*a*)   define scalar data and structured data;

(*b*)   recognise the types of scalar data: integers, real numbers, characters, and Boolean;

(*c*)   recognise the types of structured data: array structure and record structure;

(*d*)   distinguish between one dimensional array structure and two dimensional array structure;

(*e*)   explain the characteristics of record structure.

4.5 **Evolution of Programming Languages** (*4 theory periods*)

4.5.1   Generations of programming languages
4.5.2   Compilers, interpreters, and translators

Explanatory notes

Candidates should be able to

(*a*)   explain the importance of programming languages;

(*b*)   distinguish between the characteristics of five generations of programming languages: machine language, assembly language, high level language, fourth generation language (4GL), and natural language;

(*c*)   distinguish between compilers, interpreters, and translators;

(*d*)   distinguish programming language approaches: procedural, functional, and object-oriented;

(*e*)   list examples of programming languages according to generations and approaches.

4.6 **Programming Concepts of C Language** (*3 theory periods*)

4.6.1   Program frame
4.6.2   Special words

Explanatory notes

Candidates should be able to

(*a*)   explain the process of program construction and compilation which involves editor, compiler, linker, and loader;

(*b*)   identify C language program frame which involves title, declaration, and program block;

(*c*)   use C language special words: reserved words, standard identifiers, and standard functions.

4.7   Declaration (*1 theory period*)

    4.11   Scalar data
    4.7.2   Constant data
    4.7.3   Structured data

Explanatory notes

Candidates should be able to use the declarations of scalar data, constant data, and structured data.

4.8   Operators (*4 theory periods*)

    4.8.1   Arithmetic operators
    4.8.2   Logic operators
    4.8.3   Relational operators
    4.8.4   Character operators
    4.8.5   String operators

Explanatory notes

Candidates should be able to

(*a*)   use arithmetic operators and determine operator precedences;

(*b*)   use logic operators, relational operators, character operators, and string operators.

4.9   C Language Statements (*12 theory and 14 practical periods*)

    4.9.1   Input statements
    4.9.2   Output statements
    4.9.3   Conditional statements
    4.9.4   Loop statements
    4.9.5   Loop control statements

Explanatory notes

Candidates should be able to

(*a*)   use `scanf` and `printf` statements;

(*b*)   code algorithms which involve the use of conditional statements: `if`, `if … else`, nested `if`, and `switch … case`;

(*c*)   code algorithms which involve the use of loop statements: `for`, `while`, and `do… while`;

(*d*)   use `break` statement;

(*e*)   use `continue` statement.

4.10   Functions (*10 theory and 10 practical periods*)

    4.10.1 Prototype
    4.10.2 Definition
    4.10.3 Call
    4.10.4 Formal parameters and actual parameters
    4.10.5 Identifier scope
    4.10.6 Header files

Explanatory notes

Candidates should be able to

(*a*)　understand the use of functions in a program;

(*b*)　use library functions;

(*c*)　code the prototype, definition, and call of functions;

(*d*)　identify formal parameters and actual parameters;

(*e*)　determine the identifier scope, either local or global;

(*j*)　use special commands on C language preprocessor directives: `#include` and `#define`.

4.11　Data Structure Statements (*10 theory and 12 practical periods*)

　　4.11.1　Arrays
　　4.11.2　Structure statements

Explanatory notes

Candidates should be able to

(*a*)　declare an array;

(*b*)　perform operations on arrays up to two dimension;

(*c*)　give initial values to array elements;

(*d*)　use the declaration, operation, calling, sending, and returning of arrays in functions;

(*e*)　describe the concept of structure in C language;

(*j*)　use `struct`.

4.12　File Operation of Type ASClI/Text (*4 theory and 4 practical periods*)

　　4.12.1　File declaration
　　4.12.2　Input operation
　　4.12.3　Output operation

Explanatory notes

Candidates should be able to

(*a*)　declare input files and output files;

(*b*)　open and close files of type ASCII/text to input/output sequentially;

(*c*)　read data from files;

(*d*)　write data into files.

4.13　Problem Solving with C Language (*20 theory and 34 practical periods*)

　　4.13.1　Algorithm design
　　4.13.2　Program coding

Explanatory notes

Candidates should be able to

(*a*)　design algorithms;

(*b*)　code algorithms into C language as well as compile and test programs.

Coursework

The objective of the Computing coursework is to develop students' understanding and skills in information system development, multimedia application development, and problem solving using computers.

Majlis Peperiksaan Malaysia will supply the Computing Coursework Manual at the beginning of the first year's course to every school offering this subject. The manual contains regulations and guidelines on the conduct and assessment of coursework which needs to be implemented by the school as well as coursework assignments which need to be done by students.

The coursework comprises practical assignments which are to be solved by students in computer laboratories during practical periods under the supervision and monitoring of the teacher. The results of the assignments should be submitted to the teacher to be assessed according to the regulations contained in the Computing Coursework Manual.

Form of Examination

The examination for this subject consists of three papers. Candidates will be required to take all the three papers: Paper 1, Paper 2, and Paper 3.

Paper 1 (*2½ hours, 80 marks*)

This paper will consist of 9 to 11 compulsory questions of various marks based on **Topic 1** (Information and Communication Technology) and **Topic 4** (Programming).

Paper 2 (*2½ hours, 80 marks*)

This paper will consist of 9 to 11 compulsory questions of various marks based on **Topic 2** (Information System Development) and **Topic 3** (Multimedia).

Paper 3 (*School term, 40 marks*)

This paper is coursework which will be assessed by the school. Candidates will be required to carry out all coursework determined by Majlis Peperiksaan Malaysia under the supervision and monitoring of the teacher throughout the school term.

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18. Halsall, F., *Data Communications, Computer Networks and Open Systems* (4th ed), Addison Wesley, 1996.

19. Stallings, W., *Operating Systems* (2nd ed), Prentice-Hall, 1995.

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SPECIMEN PAPERS

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COMPUTING

PAPER 1

(Two and a half hours)

MAJLIS PEPERIKSAAN MALAYSIA
(MALAYSIAN EXAMINATIONS COUNCIL)

SIJIL TINGGI PERSEKOLAHAN MALAYSIA
(MALAYSIA HIGHER SCHOOL CERTIFICATE)

Instructions to candidates:

Answer **all** *questions.*

The intended marks for questions or parts of questions are given in brackets [ ].

All necessary working must be shown clearly.

This question paper consists of 4 printed pages.

1   Explain what is meant by the term *protocol*, and state the functions of protocols in data communication. [4]

2   Repetitive strain injury is one of the health risks which might be experienced by computer users.

   (*a*)   What is meant by *repetitive strain injury*? [I]

   (*b*)   Describe how computer users may be exposed to the danger of repetitive strain injury. [2]

   (*c*)   State two ways to reduce the risk of repetitive strain injury. [2]

3   "Your data is very delicious, very filling." This message was displayed on Armin's personal computer screen after he returned from lunch. Armin found out that all his data files were destroyed. He spent weeks to reenter the data which had been destroyed by a virus.

   (*a*)   Explain what is meant by a *computer virus.* [2]

   (*b*)   State two possibilities how Armin's computer was attacked by a virus. [2]

   (*c*)   What could be done by Armin to protect his computer from a virus attack? [2]

4   A program in C language is given as follows.

```
#include <stdio.h>
main ( )
{
   float y;

   y = (float)20/3;
   printf("%f\n", y);
   printf("%.2f\n", y);
   printf("%S.2f\n", y);
   printf("%-S.2f\n", y);
   return 0;
}
```

   (*a*)   Write the output which would be displayed by the above program. (The row and column positions of the print out are important.) [4]

   (*b*)   State the difference between the following pairs of print out formats.

      (i)   %f and %.2f

      (ii)   %5.2f and %-5.2f

[2]

5   The electricity payment rates for residential houses are given as follows.

Electricity units	Payment rates per unit
First 200	20 sen
Next 100	25 sen
Every additional unit	28 sen

The number of electricity units used is calculated based on the difference of meter readings between the current month and the previous month.

Write pseudocode for calculating the total electricity payment based on the above information.

[6]

6   Discuss what will happen to data transmission if one of the connections is broken in the computer network which uses the following topologies.

(*a*)   Star (excluding hub)   [4]

(*b*)   Bus   [4]

7   The International Sports Unit, Ministry of Youth and Sports, decides to organize a canoeing competition. The river bank area where the competition is to be held can be passed through by four-wheel-drive vehicles and will be supplied with electricity. More than 500 participants will enter the competition in which the distance will reach 400 km in 5 days. The sports unit wants the competition results to be announced 15 minutes after the last competitor reaches the finishing line, and decides to use computers for the registration of participants, processing of results, and communication of results to the media.

(*a*)   State the type of computer which is suitable for use in the competition. Give reasons for your answer.   [2]

(*b*)   State two input/output devices needed of the competition. Give reasons for your answer.   [4]

(*c*)   State one application software which is suitable for use in the competition. Give reasons for your answer.   [4]

8   Most of the banks in Malaysia nowadays provide automatic teller machines (ATM) facilities all over the country which can be used by customers to withdraw cash.

(*a*)   Draw an ATM network diagram of a bank. State the type of line configuration for this network.   [4]

(*b*)   Discuss the effects of the system of cash withdrawals through ATM on individuals in particular and on the public in general.   [4]

9   Hacking into a server computer is a serious problem to the managers of computer centres. Apart from stealing data, hackers are also capable of destroying data in computers of an organisation.

(*a*)   State **three** control steps to avoid hacking into a computer system, and give one example for each of the steps.   [6]

(*b*)   Describe **three** implications of failures in providing sufficient control steps to contain hacking into a computer system in an organisation.   [3]

(*c*)   "A threat to data security also means a threat to privacy." Do you agree with this statement? State **three** reasons to support your answer   [4]

10   A problem is given as follows.

> Start with reading one character code and two integers entered by a user. If the character code is '1', display the sum of the two integers. If the character code is 'b', display the difference between the two integers. If the character code is 'k', display the message "The end" and stop. If the character code is other than the above characters, display the message "Wrong code". The algorithm will repeat as long as the user does not input the end character code.

(*a*)   Name **two** forms of algorithm representation.   [2]

(*b*)   Design an algorithm in each form of algorithm representation that you have stated in (*a*) to solve the above problem.   [8]

(*c*)   Code the algorithm that you have produced in (*b*) to a program in C language.   [6]

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958/2   **STPM**

COMPUTING

PAPER 2

(Two and a half hours)

MAJLIS PEPERIKSAAN MALAYSIA
(MALAYSIAN EXAMINATIONS COUNCIL)

SIJIL TINGGI PERSEKOLAHAN MALAYSIA
(MALAYSIA HIGHER SCHOOL CERTIFICATE)

Instructions to candidates:

Answer **all** *questions.*

The intended marks for questions or parts of questions are given in brackets [ ].

All necessary working must be shown clearly.

This question paper consists of 4 printed pages.

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1   Explain what is meant *by systems analysis and design.*   [3]

2   State **three** tasks that need to be emphasised by a systems analyst during the early investigation phase.   [3]

3   You are given a task by the school management to develop a school resource centre loan system. Before the design of the system can be performed, you need to study users' requirements. State three methods which can be used in determining users' requirements, and state the source of information for each of the methods.   [3]

4   State **four** important characteristics of data or information to help the management make effective decisions.   [4]

5   State **two** standard formats for a graphics file, and explain the use of each of the formats.   [4]

6   Describe **two** negative impacts of multimedia on society.   [4]

7   Explain briefly what is meant by *system development life cycle*, and state the phases contained in it.   [6]

8   An insurance company has a number of agencies each having at least 10 insurance (selling) agents. Each insurance agent keeps a records of customers who purchased insurance policies from him/hers. You are requested by the company to develop a database system to replace the existing file system. The information in the agents file, the customers file, and the policies file are given as follows.

Agents	**Customers**	**Policies**
Agent_Number	Customer_Number	Policy_Number
Agent_Name	Identity_Card_Number	Policy_Type
Address	Name	Protection_Amount
Telephone_Number	Sex	Start_Date
Town	Address	End_Date
Customer_Number	Policy_Number	Protection_Form

    (*a*)   Copy the above tables, underline the primary key for each file, and draw lines to show the relationships between the files.   [3]

    (*b*)   Draw an entity-relationship (E-R) diagram to show the relationships between agents, customers, and policies.   [5]

    (*c*)   Map the E-R diagram that you have draw in (*b*) to a relational database scheme.   [3]

9   The picture on the next page is a print out of a web page.

    (*a*)   List the multimedia elements used in the web page.   [2]

    (*b*)   Using your creativity, make a sketch to redesign the web page layout so that it would become more effective.   [6]

COMPUTING
Malaysian Examinations Council

Aims

The Computing syllabus aims to develop the basic knowledge of information and communication technology and strong skills in *programming*, *information system development*, and *multimedia development* among students to enable them to further their studies at institutions of higher learning in various areas, especially those related to *information* and communication technology, or to help them take part in related careers.

Objectives

The objectives of this syllabus are to enable students to

(a) understand the development and use of information technology in various areas and its impact on society;

(b) understand the ethical and security issues in the use of information technology;

(c) understand the basic concept of computer and communication technology;

(d) understand the basis of construction of algorithms and acquire skills in programming to solve problems using computers;

(e) understand the principle of information systems development and acquire skills in systems analysis and design as well as skills in database design;

(f) understand the concept and components of multimedia and acquire skills in multimedia applications development;

(g) acquire skills in the use of database management system software, multimedia software, and structured programming language.

Visit MPM

MOVIE

10   A video shop has a database system to help manage the video rental by customers. The database has the videos table, the rental table, and the members table as follows.

Videos	**Rental**	**Members**
Video_ID_Number	Member_ID_Number	Member_ID_Number
Title	Video_ID_Number	Name
Popularity	Rental_Date	Address
Category	Rental_Due_Date	Telephone
Rental_Price		

   (*a*)   Draw an entity-relationship (E-R) diagram to produce the above videos table, rental table, and members table.   [3]

   (*b*)   Draw a data flow diagram to display the video details and member details for all rental which have exceeded the rental period.   [10]

   (*c*)   Draw a program structure chart diagram to display the video details and member details for all rental which have exceeded the rental period.   [4]

11   A direct selling company which has distributor representatives in each town wishes to develop its own database system. The distributors are recognized by a unique distributor number. A distributor can distribute several types of products which are recognized by a unique product number. Commission is paid to each distributor according to his/her rank, for example a normal distributor is paid 10%, a 'silver' distributor is paid 20%, and a 'gold' distributor is paid 30% of the sales earning. The attributes which have been identified by the company, that is distributor number, distributor name, distributor rank, commission, product number, product name, price and quantity of products sold, are grouped in a SALES relation.

   (*a*)   Write a schema for the SALES relation, and determine the primary key.   [3]

   (*b*)   Draw a functional dependency diagram for the SALES relation.   [6]

   (*c*)   Show the normalization steps in SALES up to third normal form.   [6]