GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

COMPUTER STUDIES HG
(Second Paper: Theory)

TIME: 3 hours

MARKS: 200

INSTRUCTIONS:

- Answer ALL the questions.
- Read the questions thoroughly.
- Number your answers clearly.
- The programming sections consist of Pascal and Delphi questions. Choose one or the other. Coding may be done in pencil.
- This paper consists of 15 pages. Check that your paper is complete.

QUESTION 1
BINARY LOGIC

1.1 Draw the given table in your answer book and complete the last column.

X	Z	XOR
0	0	
0	1	
1	1	
1	0	

(2)

1.2 Given: F(w,x,y,z) = xyz' + wxy'z + w'xyz' + w'xy'

Write the given Boolean function F in the S notation. (2)

1.3 Simplify the function

F(a,b,c) = abc + ab'c + ab'c'

algebraically to the minimum number of terms and variables. (4)

1.4 Make use of a Karnaugh diagram to simplify the following function:

$$G(a,b,c,d) = m_4 + m_5 + m_6 + m_8 + m_{12} + m_{13} + m_{14}$$ (6)

1.5 Draw a logical circuit to represent the following Boolean function:

F(a,b,c) = a'b + c (2)

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QUESTION 2
COMPUTER ARCHITECTURE

2.1 A 64-bit processor is more powerful than a 32-bit processor. Explain what this statement means with reference to the registers inside the CPU. (2)

2.2 Give a description of each of the following terms / concepts in terms of what it does AND where it is applied:

2.2.1 Hyperthreading (2)

2.2.2 Rendering (2)

2.2.3 Firewire (2)

2.3 Read the following advertisements carefully and answer the questions that follow.

Computer A	Computer B
Intel Celeron 2.4 256k D CPU	Intel P4 3.0 GHz Prescott
P4 Motherboard	P4 Motherboard
40GB ATA Hard Disk Drive	512 MB DDR Memory
128MB SDRAM Memory	120 GB SATA Hard Disk Drive
52x32x52 CDRW Drive	256 MB ATI AGP Graphics card
1.44 Stiffy drive	CDRW/DVD combo drive
USB, serial and parallel ports	1.44 Stiffy Drive
104 Keyboard and scroll mouse	USB, serial and parallel ports
Amplified Speakers	104 Keyboard and mouse
	Amplified Speakers

2.3.1 Which computer would be the most suitable for playing 3D computer games? Give ONE reason for your answer. (1)

2.3.2 (a) Explain what **clock multiplication** is. (2)

(b) Give ONE reason why clock multiplication is used on modern motherboards. (1)

2.3.3 How much cache memory does Computer A have? (1)

2.3.4 Name TWO aspects that you must keep in mind when buying more RAM for your computer. (2)

2.3.5 Explain the difference between SDRAM and DDR RAM with reference to the way data is transferred. (2)

2.3.6 Name THREE properties of USB. (3)

2.3.7 Which bus or port in Computer B has direct access to the primary memory? (1)

2.3.8 Apart from speed, what is the difference between the ATA and the SATA hard drive controllers? (1)

2.4 Pipelining takes place during the processing of instructions.

2.4.1 Define **pipeline processing**. (2)

2.4.2 Some problems can occur during pipeline processing. Briefly state how each of the following problems have been solved:

(a) The selection structure (If..then..else problem)

(b) Data dependency (2)

2.5 What is a **hardware interrupt**? Explain AND give ONE example. (2)

2.6 Explain the difference between RISC and CISC processors. (2)

2.7 Raid technology is applied to ensure data protection. Explain how RAID level 5 works. (3)

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QUESTION 3
SYSTEM SOFTWARE

3.1

> "There is some confusion amongst both newcomers to Linux and more experienced users regarding the Linux licensing scheme. Yes, the Linux kernel is open source and is completely free – even most Linux distributions are free – however there are some exceptions. Some companies such as Mandrake have boxed versions of their product that can be purchased." Regardt van der Berg – *Linux : A Technical Brief for the Layman*

3.1.1 What does the statement **the Linux kernel is open …** mean? (2)

3.1.2 What is the function of the kernel of an operating system? (2)

3.2 One of the basic functions of the operating system is the management of primary memory.

3.2.1 Describe THREE tasks the operating system must perform to be able to manage the primary memory. (3)

3.2.2 State THREE other basic functions of an operating system. (3)

3.3 FAT (File Allocation Table) keeps track of the data on your disk. Improvements in operating systems have led to development of VFAT and NTFS. Give TWO differences between VFAT and NTFS. (2)

3.4 Some programs need more RAM than is available. Without adding more RAM, how can this problem be solved? (1)

3.5 Delphi is a programming language that uses a compiler.

3.5.1 What is the function of a compiler? (1)

3.5.2 Give ONE advantage of using a compiler. (1)

3.6 It is possible to have both *Excel* and *Word* programs open at the same time so that you can copy a table from *Excel* and place it in *Word*.

3.6.1 In order to handle these activities, which processing technique must be applied by the operating system? (1)

3.6.2 Explain how this processing technique works. (3)

3.7 The BIOS has always been part of a computer system.

3.7.1 Name THREE specific tasks the BIOS performs during the starting-up process of a computer. (3)

3.7.2 What other important function is the BIOS performing while a user is working on the computer? (1)

3.8 *Defrag* is one of the utility programs. Explain why you have to run *defrag* from time to time as part of maintaining your computer system. (2)

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QUESTION 4
DATA COMMUNICATION

A school has 6 offices, directly next to one another, in one building. They have decided to connect the computers to form a network. One office will contain a server and a printer. All the other offices will have one computer each. All users will need access to the Internet.

4.1 State THREE advantages of a network. (3)

4.2 Choose THREE components from the given list and substantiate why each component is needed to set up this network.

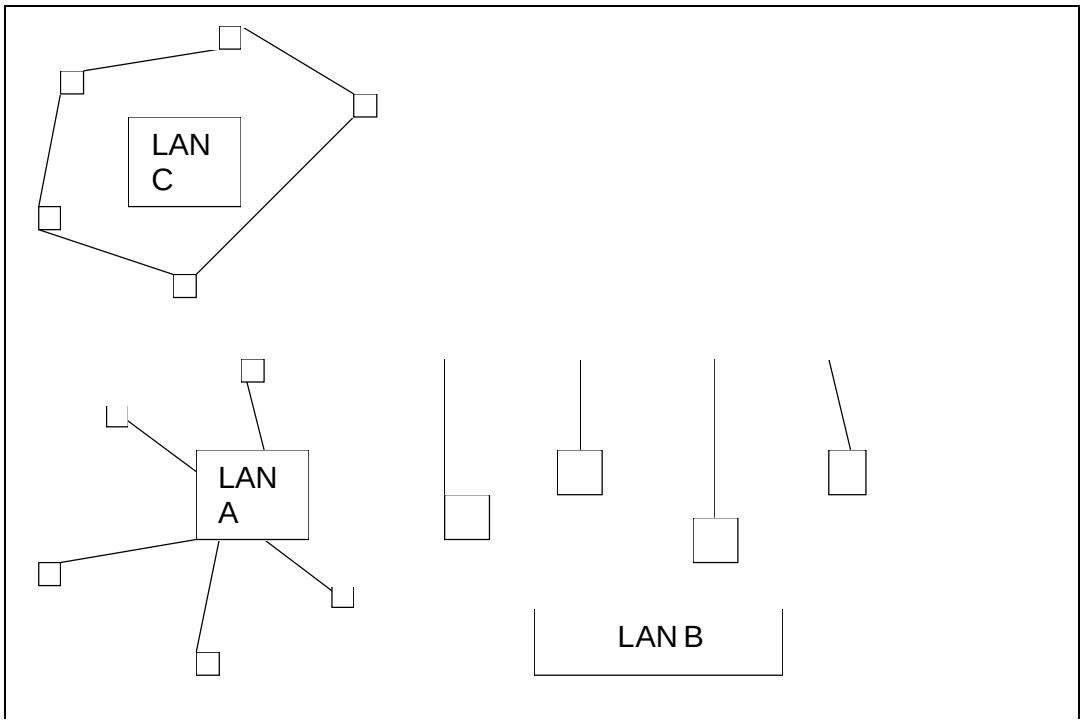
Repeater, Bridge, 10/100 Mbps Network Interface Card (NIC), 10 Mbps Switch, 100 Mbps Ethernet Switch, Fibre-optic cables, coaxial cables

(3)

4.3 What other hardware is needed for the network to have access to the Internet? (1)

4.4 When would you make use of a gateway? (1)

4.5 The school wants to use Ethernet technology.



4.5.1 Which one of the above topologies cannot be used with Ethernet technology? (1)

4.5.2 Which topology would you prefer to use with Ethernet? Give TWO reasons for your choice. (2)

4.6 The school decides to use ADSL.

4.6.1 What is the advantage of ADSL? (1)

4.6.2 ADSL makes use of packet switching to transfer data. Explain how packet switching works. (4)

4.7 Give the correct term from the given list for each of the following concepts. Write ONLY the number of the question and the correct letter. Note: Each concept or term in the given list may be chosen only once.

4.7.1	Protocol developed by the *Department of Defense Advanced Projects Agency* to allow communication over a network	A)	IPX/SPX
4.7.2	A method whereby asynchronous modems check the validity of data	B)	Checksum
4.7.3	A Novell Netware network makes use of this protocol	C)	Cell switching
4.7.4	The most popular packet-switching protocol for a WAN	D)	Packet switching
4.7.5	A mode of data transfer where each data frame is enclosed in a 53-byte cell	E)	Parity check
4.7.6	Provides wireless connectivity for mobile devices	F)	Microwaves
4.7.7	Medium of communication not susceptible to electromagnetic interference	G)	Message switching
4.7.8	Able to interpret and translate different protocols	H)	TCP/IP
4.7.9	Public data network of Telkom	J)	Wi-Fi
4.7.10	Links used for long-distance transmission of signals over inhospitable terrain	K)	Optic fibres
		L)	Radio waves
		M)	GAN
		N)	Diginet
		P)	Asynchronous transfer mode
		Q)	Gateway
		R)	Frame relay

(10)

4.8 Explain the difference between a **web browser** and a **search engine**. (2)

4.9 Explain the meaning of each of the following terms. No marks will be awarded if the acronym has only been expanded.

4.9.1 URL (1)

4.9.2 HTML (1)

4.9.3 SSL (2)

4.9.4 Hyperlink (1)

4.9.5 Digital signature (1)

4.10 Data security is always an issue amongst computer users.

4.10.1 Explain how **asymmetrical encryption** works. (3)

4.10.2 Give a practical example where **encryption** is used everyday. (1)

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QUESTION 5
SOCIAL IMPLICATIONS

5.1 'eLawyers' are now becoming a necessity. Give TWO reasons why a company would employ an 'eLawyer'. (2)

5.2 The privacy of Internet users can be violated in several ways. Briefly explain each of the following activities AND how it can be used against unsuspecting Internet users.

5.2.1 Spyware (2)

5.2.2 Cookies (2)

5.2.3 Phishing (2)

5.3 An employee has worked for a company manufacturing and selling motor vehicles for 5 years. He has been retrenched due to computerisation at the company.

5.3.1 Describe TWO **types of jobs** at this company that can be done better using a computer than by a worker. (2)

5.3.2 Describe ONE **type of job** at this company that **cannot** be done better by a computer. (1)

5.3.3 Computer specialists being fired often try to get back at the company by launching logic bombs. What is a **logic bomb**? (2)

5.4 Smart cards are used a lot in daily transactions.

5.4.1 What is a **smart card**? (2)

5.4.2 Give an example of such a card. (1)

5.5 There has been a call for all schools to have enough computers for their learners. Give THREE ways computers can be used to aid learners to perform better in their school work. (3)

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QUESTION 6
DELPHI / TURBO PASCAL PROGRAMMING

A company needs to create passwords for all its employees. The password will be made up of 3 letters and 3 numbers. Each employee will type in his / her name. The name will be converted to capital letters and then the password will be created.

Code for Turbo Pascal users

The following is part of the Turbo Pascal code for the procedure Password:

```
Procedure Password;
Var
  ……..
Begin
  Write('Type in the name ');
  Readln(sName);
  Pword := ChangeToCaps(sName);
  CreatePword(Pword);
  writeln('Your password is  ', Pword);
End;
```

Code for DELPHI users

Part of the DELPHI code for the button btnPasswd's Onclick event handler is given below:

```
Procedure TfrmGenerator.btnPasswdclick(sender: TObject );
  Var
    ……..
  Begin
    sName:=edtword.text;
    Pword:= changeToCaps(sName);
    createPword(Pword);
    lblOutput.Caption:= 'Your password is '+ Pword;
  End;
```

6.1.1 Write the self-defined function called ChangeToCaps to convert the name to capital letters. Make use of parameter passing. You may not make use of the Uppercase function in Delphi. (4)

6.1.2 To create the password the following must be done:

- Determine the sum of the ASCII values of each letter in the name once the name has been converted into capital letters.
- Use the first three digits of the sum as the first three characters of the password.
- Generate a random number between 1 and the length of the name. Use this number to get the position of a letter in the name to be added to the password. In this way add three letters to the password.

Complete the following procedure to create a password by writing the sections (a) to (e).

```
Var
  (a){declare variables}                                          (2)
Begin
  (b){causes the random numbers to change every time              (1)
                                  program is executed}
  (c){Initialise sum}                                             (1)
  (d){Code to calculate the total of the ASCII values}
{DELPHI}NewWord := IntToStr(iSum);                                (4)
{Turbo Pascal}Str(iSum, NewWord);
NewWord := copy (NewWord 1,3);
(e){code to add three random letters to the password}
Pword := NewWord;
End;                                                              (7)
```

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QUESTION 7
DELPHI / TURBO PASCAL PROGRAMMING

7.1 Given:

```
procedure XYZ (arrNames: TNames;sName:string; var iPosi:integer);
Var   bFlag   : boolean ;
      B, T, M : integer;
begin
      B := 1;
      T := 5;
      iPosi := 0;
      bFlag := false;
       While (B <= T) and (NOT bFlag) do
        begin
          M := (B + T) div 2;
          if arrNames[M] > sName then
             T := M - 1
          else if arrNames[M] < sName then
             B := M + 1
          else begin
                  iPosi:= M;
                 bFlag:=true;
               end;    {end if}
          end;     {end while}
end;
```

The following data has been read into the array called arrNAMES of type string:
Gail, James, John, Mary, Sue

7.1.1 Write the declaration of the array arrNames. (2)

7.1.2 Explain the difference between REFERENCE and VALUE parameters. Use examples from the given code. (4)

7.1.3 Write a correct call statement for this procedure. (3)

7.1.4 (a) Draw a trace table and make use of the following headings to determine the result of the procedure XYZ: (8)

The procedure receives the given array with 5 names and the name James.

B	T	M	iPosi	bFlag	(B <= T) and (NOTbFlag)?	arrNames[M] > sName?	arrNames[M] < sName?

(b) What will be a more descriptive name for this procedure? (1)

(c) Assume the content of the array changes as follows:

Lee, Ann, Susan, Brian, Craig and the name is Brian

Explain why the result of the procedure will be incorrect using this data. (1)

7.2 Given:

Rainfall data is recorded for 5 weeks and 7 days of each week and saved in a two dimensional array. Example of the data:

Mon	1	2	0	0	0
Tue	0	2	3	0	0
Wed	1	2	0	4	2
Thu	1	5	0	2	0
Fri	1	6	2	0	0
Sat	1	0	3	0	0
Sun	0	0	1	1	9

Array

The part of the program given below is used to calculate the total rainfall for each week and store it in row 8 under the corresponding column for the week. The total rainfall for the month is stored in row 9 column 1. All data has been read into the array.

```
{1}Type str4 = string[4];
       arrRain = array[1..6,1..9] of str4;
{2}Var  week,col,row : integer;
{3}Begin
{4}  Week := 0, Total := 0;
{5}  For row := 1 to 7 do
{6}  begin
{7}  For col := 2 to 6 do
{8}     week := week + Rainfall[row,col];
{9}  end;
{10} Rainfall[7,row] : = week;
{11} Total := Total + week;
{12} Rainfall[9,1] : = total;
{13} End;
```

{You may not change the Type-declaration}

There are a few errors in the program.

The line number and the error-messages are given. Use this information to correct the code. Write ONLY the line number and the correct code. You may not change the declaration of the Type-statement.

7.2.1 Line 4 – Error 85 ';' expected (1)

7.2.2 Line 4 – unknown identifier (1)

7.2.3 Line 8 and Line 10 – unknown identifier (2)

7.2.4 Line 8 and Line 10 – Error 26 – Type mismatch (2)

7.2.5 Line 10 – Constant out of range (1)

7.2.6 Line 12 – Type mismatch (1)

7.2.7 Certain values in the array will be calculated incorrectly because of three logical errors in the program. Indicate where the logical errors occur and write the code to correct the logical errors. (3)

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QUESTION 8
DELPHI / TURBO PASCAL PROGRAMMING

The following programming code is given:

```
Type str10 = string[10];
     str5 = string[5];
     TRec = record
        Name    :str10;
        Areacode:str5; // including brackets
        Tel     :str10;
     end;
Var
 Rec  : TRec;
 DataF : file of TRec;
 sLine : string;
```

Make use of the above variables and answer the following questions:

8.1 Write the code to read the 3rd record of the data file DataF using a direct access to the record in the file. (3)

8.2 Write the statement to determine and display the number of records there are in this data file. (1)

8.3 Given:

```
Procedure Testing;
begin
{Line 1}
While not eof(DataF) do
 begin
   {Read and display record}
 end;
CloseFile(DataF);
end;
```

A learner is testing the procedure. What will be displayed and give a reason for the output if the learner makes the following changes:

8.3.1 {Line 1} is replaced with 'reset(DataF)'? (2)

8.3.2 {Line 1} is replaced with 'rewrite(DataF)'? (2)

8.4 You receive a text file from a friend containing the email addresses and telephone numbers of all your friends. Example of the format of one line from the text file:

peter@yahoo.com(011)9725421

john@netactive.co.za(011)6789045

The code below must read the information from the text file and write the name, area code and telephone number to the data file.
Complete part (a) to (c) in the code:

```
While not eof(TextF) do
  begin
    Readln(TextF, sLine);
```

(a) `{Code to move marker to the end of the data file }` (2)

(b)
```
{Code to assign the persons' name, area code and
  telephone number to the record Rec}
{Example : peter 011 9725421
           john  011 6789045}
```
(8)

(c)
```
{Code to write the record to the data file}
    end;
```
(2)

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TOTAL: 200

END