## Part A - Structured Essay

Answer all the **four** questions **on this paper itself.**

Do not write in this column

1. (a) State the main technologies used in the first four generations of computers.

(b) Draw a diagram to depict the fetch-execute cycle used in program execution.

[ see page three

(c) Show how the computation 5+ (-3) is done in 8-bit two's complement arithmetic. Explain how you deal with the carry generated from the most significant bit.

Do not write in this column

2. (a) Encircle the most suitable entry in the second and third columns corresponding to the properties listed in the first column of the following table with respect to FAT32 and NTFS file systems.

| | FAT32 | NTFS |
|---|---|---|
| Maximum file size | limited/unlimited | limited/unlimited |
| Maximum file name length | limited/unlimited | limited/unlimited |
| Security | yes/no | yes/no |
| Support of Unicode | yes/no | yes/no |

(b) A computer has an 18-bit virtual memory address space where six bits are used for a page address.

(i) Calculate the total number of pages defined by the above addressing scheme.

(ii) Consider the following virtual memory address:

010111000000111100

What is the page and displacement (Offset) of this address?

[ see page four

(c) Draw the operating system process transition diagram from process creation to termination.

Do not write in this column

3. Consider the following scenario.

Students in a school participate in different sports such as volleyball, track and field athletics, table tennis, etc. The principal wants to maintain a registry with **admission number**, **student name**, **home address**, **class**, and **sports** he/she participates. A student can participate in **more than one** sport. For a particular sport, there can be **more than one** student. Each student can participate pre-defined number of hours in a sport.

(a) Draw an ER diagram for the above scenario.

[ see page five

(b) Classify with reasons whether the cardinality of relationship(s) identified in section (a) is one-to-one, one-to-many, or many-to-many.

Do not write in this column

| Relationship | Cardinality | Reason |
|---|---|---|
| | | |

(c) "ER diagrams do not allow attributes to be assigned on relationships". State whether this statement is true or false. Explain your answer by using the given scenario.

[ see page six

(d) A database designer suggested the following relation for the above system. State two weaknesses of this relation and suggest necessary modifications.

Do not write in this column

| AdmissionNo | StudentName | HomeAddress | Class | SportName |
|---|---|---|---|---|
| | | | | |
| | | | | |

[ see page seven

4. (a) Classify the following software as either "system software" or as "application software".

| Software | Classification |
|---|---|
| Linux | |
| Word Processor | |
| Web Browser | |

(b) Computer storage devices can be categorized into three types based on the medium used to sto / retrieve data. State the **three** types of media and give an example for each type.

(c) The transaction file in a company's payroll system includes employee number, hours worke department code, and week number. Assume that the system maintains a Employee master tabl and a Department master table. Encircle the most appropriate validation check for each of th data elements given in the following table.

| Data element | Validation checks |
|---|---|
| employee Number | Presence in Employee master table / Numeric value |
| hours worked | Presence in Employee master table / Range check |
| department code | Presence in Department master table / Range check |
| week number | Length / Range check |

(d) Describe the terms "Video conferencing" and "Copyright".

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2011 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர)ப் பரீட்சை, 2011 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2011

තොරතුරු හා සන්නිවේදන තාක්ෂණය II
தகவல், தொடர்பாடல் தொழினுட்பவியல் II
Information & Communication Technology II

20 E II

**Instructions:**

* *Answer any **four** questions only.*

## Part B

1. (a) What are the three (3) main components of a Central Processing Unit (CPU) of a typical computer? List the main functions of these three components.

   (b) Briefly explain why storage compaction is needed in memory management.

   (c) For a file of size 10400 bits, calculate the wastage in file space due to incomplete filling of the last cluster (Assume that a cluster has a size of 512 bytes.)

   (d) A digital circuit takes four binary digits as an input, and produces 1 as its output if the decimal value represented by the four binary digits is a **prime number** (number which can only be divided by itself and 1), and 0 otherwise. Assume that all four binary digits represent positive decimal values (No bit is allocated for the sign).

   (i) The following truth table is designed to describe the above circuit, in which A, B, C and D represents the four binary inputs from the most significant bit to the least significant bit and F(A,B,C,D) as the output of the circuit. Copy the following truth table onto your answer sheet as it is and complete the output column.

| A | B | C | D | F(A,B,C,D) |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | |
| 0 | 0 | 0 | 1 | |
| 0 | 0 | 1 | 0 | |
| 0 | 0 | 1 | 1 | |
| 0 | 1 | 0 | 0 | |
| 0 | 1 | 0 | 1 | |
| 0 | 1 | 1 | 0 | |
| 0 | 1 | 1 | 1 | |
| 1 | 0 | 0 | 0 | |
| 1 | 0 | 0 | 1 | |
| 1 | 0 | 1 | 0 | |
| 1 | 0 | 1 | 1 | |
| 1 | 1 | 0 | 0 | |
| 1 | 1 | 0 | 1 | |
| 1 | 1 | 1 | 0 | |
| 1 | 1 | 1 | 1 | |

   (ii) Write a Boolean expression to represent the logic function of the above circuit in the sum of products form.

   (iii) Design a logic circuit for the Boolean expression you have obtained for the above part (ii).

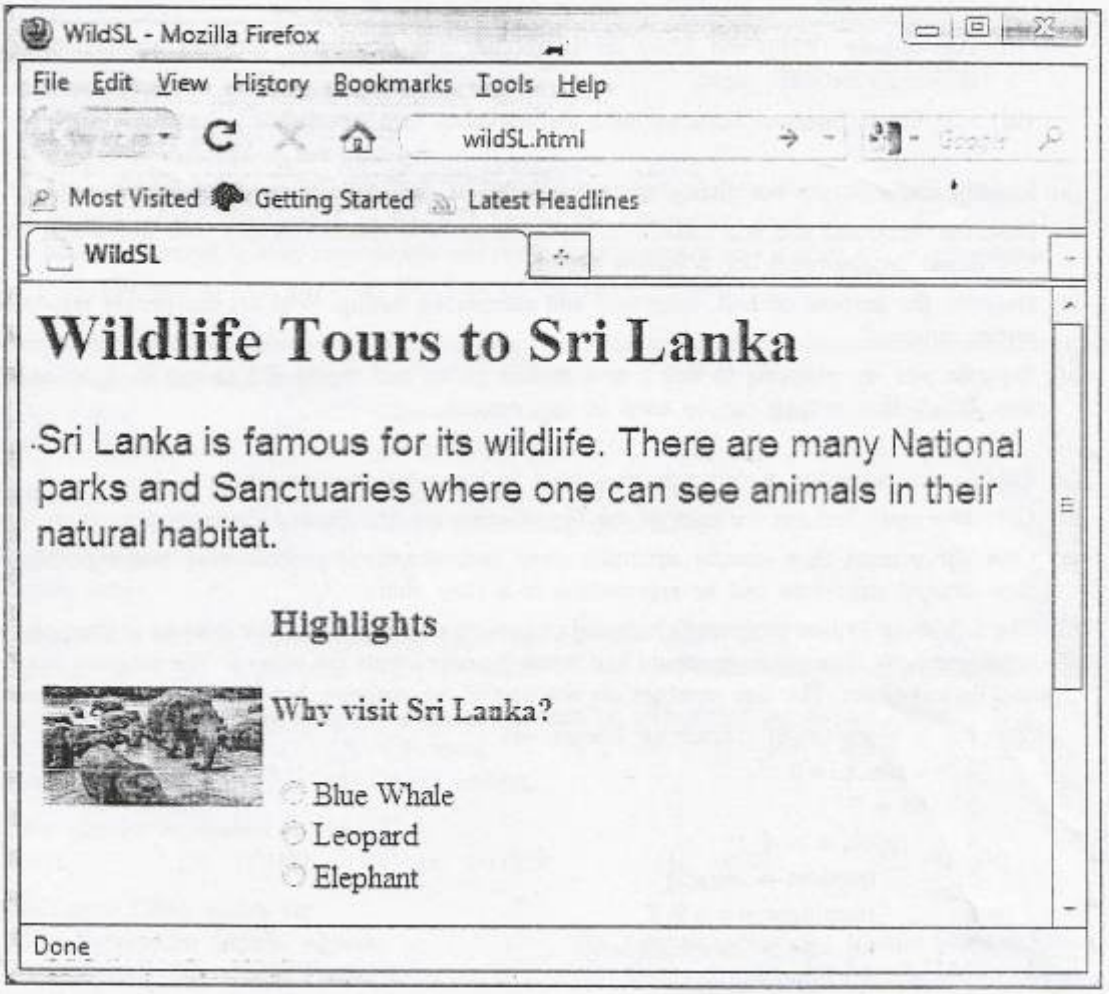
[ see page nine

2. (a) Describe the terms "elements" and "attributes" with respect to an HTML document.

(b) Identify each of the following as either an element or an attribute and describe their functionlity.

(i) br (ii) href (iii) src (iv) html

(c) Consider the following figure which shows a section of a web page of a tour operating company in Sri Lanka.




Answer the following questions using the above figure.

(i) It is required to format all the paragraphs of the above HTML document in "**arial**" font, 14 font size and in **blue** colour. Write the required CSS code segment for the paragraph.

(ii) Explain the effect of having the following tag in the above HTML document.

```
<a href = "elephants.jpg"><img src = "elephants_tnl.jpg"
ALT = "Tour to Yala" width = "288cm" height = "156cm"
style = "border:none"/></a>
```

(iii) Write HTML code segment to create the collection of three radio buttons labelled as 'Blue Whale', 'Leopard' and 'Elephant' as appeared in the above HTML document.

(iv) The company wants to add a table showing the rates as given below with the caption 'Wild Sri Lanka', to the above HTML Document.

| Days | Price |
|---|---|
| 7 | US$910 |
| 10 | US$1220 |

Write HTML code segment to create the table.

[ see page ten

3. (a) You have been asked to design two physically separated networks, namely A and B, each having exactly 10 computers. The IP addresses of A and B networks are **10.32.5.0** and **10.32.6.0** respectively. It is required that the computers in the two networks must be able to communicate with each other.

(i) Suggest a suitable subnet mask for each of these networks.

(ii) Name the device required to connect these two physical networks to communicate with each other.

(iii) Draw a network diagram for the above network and assign suitable IP addresses for the devices in these two networks.

(b) (i) Compare TCP and UDP protocols in terms of reliability.

(ii) Peer-to-peer (P2P) and client-server models are distributed application architectures. State the difference between them.

(iii) List the differences between hubs and switches in a network.

4. (a) Identify and describe the phases of the waterfall model in software development.

(b) Describe functional and non functional requirements of a system. Identify **two functional** and **three non functional** requirements for a mobile phone.

(c) Describe the purpose of unit, integrated and acceptance testing. Who are the people responsible for each testing process?

(d) Suppose you are planning to buy a new mobile phone and would like to test its functionality. Describe how Black Box testing can be used in this process.

5. (a) Explain the necessity of program translators in computer programming.

(b) Give **two** main features for each of the First-Generation and Second-Generation programming languages.

(c) Give **three** main flow control structures used in a structured programming language. Show how these flow control structures can be represented in a flow chart.

(d) The following Python program is intended to convert user given positive integers to their equivalent binary representations. The program should halt when the user inputs the value 0. The program has both syntactic and logical errors. The line numbers are not part of the program, but they are used to reference the lines.

```
1   x = int (input ("Enter an integer →)
2   while x != 0 :
3   bn = ""
4     while x > 1 :
5       quotient = int(x/2)
6       remainder == x % 2
7       bn = bn + str(remainder);
8           x = quotient
9       bn = str(x) + bn
10    print ("Binary Number ", bn)
11    x = int (input("Enter an integer →)
```

(i) State the lines with syntactic errors and state the error.

(ii) Which lines of the program should be changed and state how they should be changed to obtain the desired results. (You are **not** allowed to add new lines or to delete existing lines.)

6. (a) (i) Using an example for each category explain the **three** types of business: Business to Business (B2B), Business to Consumer (B2C) and Consumer to Consumer (C2C) in e-commerce.

(ii) Chairman of a company is considering fax, e-mail and web as communication tools for a B2E (Business to Employee) application. Being an ICT student recommend the most appropriate tool with reasons.

(b) (i) In the domain of Agent technology, explain the term 'Agent'.

(ii) Give **two** main characteristics of an Agent.

(iii) Briefly explain an example where Agent technology could be used effectively.

* * *