Important:

* This paper consists of 14 pages.

* This question paper comprises of two parts, Part A and Part B. The time allotted for both parts is three hours.

* Use of calculators is not allowed.

Part A - Structured Essay:
(pages 2 - 8)

* Answer all the questions on this paper itself. Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and that extensive answers are not expected.

Part B - Essay:
(pages 9 - 14)

* This part contains six questions, of which, four are to be answered. Use the papers supplied for this purpose.

* At the end of the time allotted for this paper, tie the two parts together so that Part A is on top of Part B before handing them over to the Supervisor.

* You are permitted to remove only Part B of the question paper from the Examination Hall.

For Examiner’s Use Only

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<th>Part</th>
<th>Question No.</th>
<th>Marks</th>
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Final Marks

In numbers

In words

Code Number

Marking Examiner 1

Marking Examiner 2

Marks checked by:

Supervised by:

Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions and decide on the questions that you give priority in answering.
1. (a) (i) State two benefits of using Cascading Style Sheets (CSS).

(1) .................................................................................................................

(2) .................................................................................................................

(ii) Write the output of the following HTML code segment when rendered by a web browser.

```html
<html>
<body>
<u> Important Sites </u>
<ul>
  <li> <a href="www.nie.lk/index.html"> National Institute of Education </a> </li>
  <li> <a href="www.doenets.lk/exam/index.html"> Department of Examinations </a> </li>
</ul>
</body>
</html>
```

(iii) Write the output of the following HTML code segment when rendered by a web browser.

```html
<html>
<body>
<p>
<center> Department of Examinations <br> Pelawatta
<br> Battaramulla </center></p>
</body>
</html>
```

(b) Consider the following HTML code segment:

```html
<body>
<h1> Introduction to Web Technologies </h1>
<h3> HTML </h3>
<p> HTML is the standard markup language for creating web pages </p>
</body>
```

Write down the internal styles required to apply the styles mentioned in the following table for the elements h1 and p in the above code segment.
(c) Consider the HTML form given below rendered by a web browser:

This is a registration form used for registering students. It is required to enter Student Name as a text input, select Gender, select District and then click Submit button. Complete the following HTML code segment by filling the spaces to display the form.

```
<html>
<body>
<h3>Student Registration</h3>

............... action="register.php" method="post">
</div>

Student Name <input .........................="name">
</div>
<br>
<div>
Gender
<input .........................="gtype" .........................="male" checked> Male
<input .........................="gtype" .........................="female" > Female
</div>
<br>
<div>
Selected District :
............... ="city">
<option .....................="Colombo" > .................. </option>
<option .....................="Jaffna" > .................. </option>
<option .....................="Matara" > .................. </option>
</div>
<br>
<input ......................... name="submit" .........................="Submit">
</div>
</body>
</html>
```
2. (a) Match each of the given phrases (i)~(viii) relating to e-commerce with the most suitable term from the list below.

List = \{ brick-and-click, content provider, e-commerce, group purchasing, information broker, online marketplace, pure-brick, pure-click, reverse auction, virtual community, virtual storefront \}

Phrases:
(i) allows third party businesses (other businesses) to sell their products and services through the website and charge a percentage of the sale value as the fee
(ii) provides frequently updated material such as news, blogs, videos etc. online
(iii) allows sharing common interests and ideas over the Internet
(iv) consumer transactions are processed by the business operator’s web portal and then delivered and fulfilled by the participating retailers or wholesalers
(v) has a physical shop as well as an online shop
(vi) is a business that collects publicly available data about consumers on the Internet, analyzes and summarizes them and sells that information to other parties
(vii) the sellers compete to obtain business from the buyer using the internet and prices may typically decrease as the sellers underbid each other
(viii) obtain discounts from vendors on the internet based on the collective buying power of members

Note: Write only the matching term against the phrase number.

(i) ..............................................
(ii) ..............................................
(iii) ..............................................
(iv) ..............................................
(v) ..............................................
(vi) ..............................................
(vii) ..............................................
(viii) ..............................................

(b) (i) Write down the two’s complement representation of $12_{10}$ using 8 bits.

(ii) Write down the two’s complement representation of $-68_{10}$ using 8 bits.

(iii) Compute $-68_{10} + 12_{10}$ using the above representations (i) and (ii).
(iv) State one advantage of using two's complement representation for data in internal operations of a computer.

3. (a) Consider the following Entity Relationship (ER) diagram:

- Briefly explain why the 'Phone' attribute is shown using a different symbol compared to other attributes.

- Briefly explain why DEPENDANT entity is shown using a different symbol compared to COMPANY.

- The following relational tables are constructed using the ER diagram shown above. In each of the tables, the field names are missing.

  COMPANY (..........)
  STAFF (..........)
  STAFF_PHONE (.........)
  DEPENDANT (..........)

  Identify the missing field names in each table and write them down against ① - ③.

  ① - 
  ② - 
  ③ -
(iv) Write an SQL statement to display Names and Addresses of all the STAFF.

(v) Write an SQL statement to display the names of the dependants of staff member with StaffID = 'E001124'.

(b) (i) Identify and explain the fundamental error in the following Data Flow Diagram (DFD).

(ii) Write down whether each of the following statements regarding software agents is either True or False.

1. A software agent can perform tasks in achieving a goal with minimum or no direct supervision.

2. Software applications can interact with agent without direct supervision of a user.

3. A user may obtain answers to a problem directly from an agent.

4. A multi-agent system is a network of problem-solving entities called agents that work together to find answers to problems that are beyond the individual abilities of each agent.

5. In a multi-agent system, individual agents may compete or co-operate to achieve the system goals.

4. (a) Consider the following diagram which shows how the abstract layers of a computer system are related.
Choose and write down the correct terms from the list given below for labels A, B, C and D.

List = \{compiler, computer hardware, live-ware, operating system, system / application programs\}

A ..................................................
B ..................................................
C ..................................................
D ..................................................

(b) Order four of the following statements in the correct sequence to describe the operations that take place when a computer is switched on.

(Note: Two of the statements will not be needed.)

A - The BIOS copies Operating System (OS) files into memory and the OS starts executing.
B - The BIOS looks to the CMOS chip to tell it where to find the OS.
C - The compiler is started.
D - The contents in memory is swapped to the hard disk.
E - The OS loads the device drivers that it needs to control the devices and gives a login interface to the user.
F - Triggered by a series of clock ticks, the CPU executes the startup program's instructions in the BIOS that involves the power on self-test.

The sequence of operations is: (fill in the boxes with relevant letters)

[ ] [ ] [ ] [ ]

(c) The state transitions that could occur in a process running on a computer with a multi-tasking operating system is shown in the following diagram:

(i) Choose and write down the transition triggers indicated by the labels A, B, C and D from the list given.

List = \{interrupt, Input/Output (I/O) or event completion, I/O or event wait, scheduler dispatch\}

A ..................................................
B ..................................................
C ..................................................
D ..................................................

(ii) For the process above, give one possible reason for the following transition trigger:

interrupt: .................................................................
(d) In a certain computer, the physical memory has a total capacity of 4 GB. The size of a memory frame is 4 KB.

(i) Compute the total number of frames in the physical memory.

(ii) The operating system maintains a data structure named the page table in respect of each process running in the computer. For what purpose is it used?

(iii) With respect to the physical memory size, what is the benefit of using the technique of virtual memory in the above computer?

\* \*