

<table>
<thead>
<tr>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11</td>
<td>5</td>
<td>21</td>
<td>31</td>
<td>5</td>
<td>41</td>
<td>4</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>4</td>
<td>22</td>
<td>32</td>
<td>5</td>
<td>33</td>
<td>2</td>
<td>43</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>4</td>
<td>23</td>
<td>5</td>
<td>24</td>
<td>34</td>
<td>2</td>
<td>44</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>1</td>
<td>24</td>
<td>4</td>
<td>25</td>
<td>35</td>
<td>4</td>
<td>45</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>2</td>
<td>26</td>
<td>3</td>
<td>36</td>
<td>5</td>
<td>46</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>3</td>
<td>27</td>
<td>3</td>
<td>37</td>
<td>4</td>
<td>47</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>19</td>
<td>4</td>
<td>28</td>
<td>1</td>
<td>38</td>
<td>1</td>
<td>48</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>4</td>
<td>29</td>
<td>5</td>
<td>39</td>
<td>3</td>
<td>49</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>5</td>
<td>30</td>
<td>2</td>
<td>40</td>
<td>All</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© මැටිකියා/ ශීංමික කාර්යක්ෂමය;
සමාංශවල/ පළමු කාලයේ 01 මිනියර්/ඒකක් අංකය
විශේෂ පළමු/හොඳීම පද්ධකයක් 1 x 50 + 50
Special Notes:

i. .../... indicate only one of the options included are considered as one answer
ii. Underlined key words or synonyms are mandatory in a given answer
iii. [..] {} indicates marking guidelines

If any amendments are made during 9th September 2018 meeting such changes need to be correctly written in the cages provided on pages 17-18 and verified with the panel/chief examiners by the individual examiner.

A ක්‍රමවාද

i. Special Notes:
   i. .../... indicate only one of the options included are considered as one answer
   ii. Underlined key words or synonyms are mandatory in a given answer
   iii. [..] {} indicates marking guidelines

iv. 2018ේ 09/09 ප්‍රධාන පරිකාර දේශවලේ, පැවතියේදී පරිකාර විශේෂ පරිකාරයේ පැළවතියන්ගේ උත්සවයේ පැහැදිලි පැමිණියේණි
   (ශ්‍රී ලංකාවේ මිදින් පරිකාර තැනුණිසා ඉහළින් පැරිකාර විස්තරව සහ පැරිකාර දේශවලේ පැහැදිලියේ පැහැදිලියේ)
   iv. 9 ට පැහැදිලි බලපතිවර පැරිකාරයේ පැහැදිලි සංවර්ධනය පැහැදිලි පැරිකාරයේ පැහැදිලි පැහැදිලි සංවර්ධනයේ සමාගම ක්‍රම පරිකාරයේ පැහැදිලියේ

1. (a) (i) බාගත දේශ්‍වතින් (Cascading Style Sheets (CSS)) විස්තර කරන්නේ පියවරයකු පැහැදිලියේ පැහැදිලියේ

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

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

   i. Easy maintenance and update web pages
   ii. Style sheets guarantee consistency throughout website
   iii. re-styling of any document, without modifying the original HTML
   iv. A single document can be presented in multiple styles by using multiple style sheets (Multiple Device Compatibility)
   v. More formatting options
   vi. Present different styles to different users/ Ease of presenting different styles to different viewers
   vii. Pages load faster/ lightweight code/ The smaller the files the faster the download. Using style sheets can help minimize file sizes / CSS reduces code duplication
   viii. Search engine optimization benefits
   ix. Cleaner code
   x.

වේදීමේ ප්‍රශ්නවාදමක පියවරයකු | දූර්පොල්ලම් (ශ්‍රී ලංකාව) කොටස - 2018 | පොල්ලම් කොටසක් පොල්ලම් කොටසක් පොල්ලම් කොටසක්
(ii) නොතුම් ක්‍රමයේ HTML මෙහෙයින් නොතුම් ක්‍රමයේ අර්ථ දක්වා ඇති මාළිගයක ලෙස නැවත තැන්නේ පැයික.

```
<html>
<body>
<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>
```

[0.5 කඳුරුම් කාරකම් විසින් අර්ථ දක්වා ඇති මාළිගයක ලෙස නැවත තැන්නේ පැයික]

0.5 කඳුරුම් කාරකම් විසින් රාශියේ පිටිමක්

Total = 1 කඳුරුම්
(iii) සක්‍ෂ සුභුර පෙදේ නොද බැදුන්වීමෙන් අසමාර්ථ ආකාර ගැනීම ලැබේ. 

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

[0.5 marks for three centered lines

0.5 For the hardline

Total = 1 mark]

{Total for 1. (a) = 4 marks}

(b) මෙම කොටස පෙදේ HTML විසින් අනුව සමඟ

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

[0.5 for starting and closing

'style' tags]

h1 { color: blue;
    text-align: center/centre;
    'centre' also
    font-family: Arial;
    }

[1 mark]  (Note:

acceptable due to typographical error in the table given)
\[
P \{\text{background-color: yellow;} \text{; font-size: 12px;} \}\]
\]

\[
\text{Total for part } b \text{ = 2 marks}
\]

\[
\begin{html}
\text{Student Registration} \langle/\text{h3}\rangle
\langle/\text{form} \text{ action="\" method="\" post\"} \rangle
\langle/\text{form}\rangle
\]
\[
\text{Gender} \langle/\text{div}\rangle
\text{Male} \langle/\text{input} \text{ type="radio" name="ptype" value="male" checked} \rangle \text{ or } \text{Female} \langle/\text{input} \text{ type="radio" name="ptype" value="female"} \rangle \]
\]

\[
\text{Selected District} \langle/\text{div}\rangle
\text{Colombo} \langle/\text{option}\rangle
\]

\[
\text{Total for both open and close}
\]
2. (a) 20 (i) - (viii) (0.5 for all three options in correct order)

(iii) 

(ii) 

(iv) 

(v) 

(vi) 

(vii) 

(viii) 

(Jaffna) 

(Matara) 

[0.5 for all three options in correct order]

(Note: both ‘’ and “ are acceptable in answer)

{Total for 1.(c) = .4 mark}

[TOTAL MARKS FOR Q1 10 MARKS]
i. Virtual storefront
ii. Content provider
iii. Virtual community
iv. Online marketplace
v. Brick and click
vi. Information broker
vii. Reverse auction
viii. Group purchasing

[Note: correct key words(exact) should be written from the given list]

[any 1 correct = 1 mark
Any 2 correct = 2 marks
Any 3 correct = 3 marks
Any 4 correct = 4 marks
Any 5 correct = 4.5 mark
Any 6 correct = 5 marks
Any 7 correct = 5.5 marks
All 8 correct = 6 marks]

{Total for 2 (a) = 6 marks}
(b) (i) $12_{10}$'s two's complement (two's complement) is its binary representation in 8-bit form.

$$00001100$$

[1 mark]

(ii) $-68_{10}$'s two's complement is its binary representation in 8-bit form.

$$\begin{align*}
0 &\rightarrow 01000100 \\
\text{Complement of (68)} &\rightarrow 10111111 \\
-68 &\rightarrow 10111100
\end{align*}$$

[final answer 1 mark, if only first two steps are correct and answer incorrect 0.5 maximum mark 1]

(iii) From (i) and (ii) its binary addition $-68_{10} + 12_{10}$ is carried out.

$$\begin{align*}
10111100 \\
+ 00001100 \\
\hline
11001000
\end{align*}$$

[1 mark, No partial Marks]

(iv) More efficient calculations
   Possible to represent negative number
   Subtractions are carried out as additions
   has only one value for zero
3. (a) ตัวอย่าง โครงสร้าง (ER) แสดงผลการศึกษา.

(i) ตัวแปร ที่มีคุณสมบัติ (attribute) ที่มีความคลาด "Phone" ซึ่งมีการมีค่ามีค่าหลายค่า และอื่น ๆ มีค่ามีค่าที่เดียว.

"Phone" – is a multivalued attribute / attribute can have multiple values and other attributes have only single values.

(ii) COMPANY คือ ตัวแปร (entity) ซึ่งมีการมีและการไม่ได้คลาด "Phone" ซึ่งมีการมีค่ามีค่าหลายค่า แต่ตัวแปรข้อความอย่างเดียว.

"DEPENDANT" is a weak entity / cannot be uniquely identified by its attributes alone or equivalent meaning.

[1 mark]

(Total for 2 (b) = 4 mark)

[TOTAL MARKS FOR Q2 10 MARKS]
(iii) COMPANY (........plorer
STAFF (......................)
STAFF_PHONE (................)
DEPENDANT (...........)n

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>STAFF</th>
<th>STAFF_PHONE</th>
<th>DEPENDANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(...........)</td>
<td>(......................)</td>
<td>(................)</td>
<td>(...........)</td>
</tr>
</tbody>
</table>

P -> CompanyRegNo, Name, Address

Q -> StaffID, CompanyRegNo, Name, Address, DateOfBirth, Since
   or
   Underline 2 marks

Q -> StaffID, CompanyRegNo, Name, Address, DateOfBirth

R -> StaffID, Phone

S -> StaffID, Name, Relationship, Gender, DateOfBirth

[Note: Overall completeness mark of 0.5 for part iii not awarded if 'Since' missing, however 0.5 awarded for other five fields in Q] for overall completeness (properly underlines key fields, 'Since' field included in Q, attribute names correctly written in correct upper-lower case with spellings, and All P-S correct) + 0.5
Total = 2.5 marks

(iv) SELECT Name, Address FROM STAFF;

Select Name, Address from STAFF;  

[1 mark,  
Correct field names + 0.5,  
Incorrect field names - 0.5]
(v) StaffID = 'E001124' may not be ambiguous, explain why and select Name from (DEPENDANT) where StaffID = 'E001124'.

Select Name from DEPENDANT where StaffID = 'E001124'.
Or
Select Name from DEPENDANT where StaffID like 'E001124'.

[String has be within double or single quotes  
No partial marks  
Incorrect field names no marks]

1 mark]

{Total for 3(a) = 6.5 marks}

(b) (i) Create a data flow diagram (DFD) for the following scenario:

There cannot be a Data Flow from one Datastore to another Datastore without a process directly.

If more than one answer given as the fundamental error = no marks]
(iii) අනුරාධා ප්‍රාංකිතික ප්‍රාමික නැමුම් කලා ප්‍රාංකිතික කොට මට සැමා අතර යනු අංකයේ අතර යන ලදී සළකතා.

1. True
2. True
3. True
4. True
5. True

[0.5 x 5 marks]
Total = 2.5 marks
{Total for part (ii) = 3.5 marks}
[TOTAL MARKS FOR Q3 10 MARKS]
4. (a) State the shape of layers (abstract layers) for each of the layers. (1 mark)

A, B, C and D represent different layers of an OS. Choose the appropriate labels for A, B, C, D.

Labels: {Compiler (compiler), System/Application programs, Operating System, Computer Hardware}

A -> Compiler
B -> System/Application programs
C -> Operating System
D -> Computer Hardware

1 correct (with others blank) 0.5 marks,
2 correct (with others blank) 1 marks,
3 correct (with others blank) 1.5 marks,
All correct = 2 mark
(b)  
A - Switched on (switched on)  
B - CMOS BIOS  
C - Compiler  
D - Device drivers  
E - Device drivers and Operating System (device drivers) and CPU  
F - Clock ticks  

A - BIOS  
B - CMOS  
C - Compiler  
D - Device drivers  
E - Device drivers and Operating System (device drivers) and CPU  
F - Clock ticks

A - Switched on  
B - CMOS BIOS  
C - Compiler  
D - Device drivers  
E - Device drivers and Operating System (device drivers) and CPU  
F - Clock ticks

F \rightarrow B \rightarrow A \rightarrow E

[All correct= 2 marks  
No partial marks]
A - Interrupt
B -> Scheduler dispatch
C - I/O or event completion
D - I/O or event wait

A - A interruption
B -> Scheduler dispatch
C - I/O or event completion
D - I/O or event completion

[Each correct 0.5 x 4= 2 marks
Total = 2 marks]

(ii) The correct answer is

OS decides to let another task run / process timeout if a higher priority process comes.

[1 mark]
{Total for (c) = 3 marks}

(d) The number of frames in physical memory is 4GB or 4096 (frame) or 4KB (frame).

(i) The number of frames (opt.

4 x 1024 x 1024 /4 frames ( gibi)
or
1048576 frames ( gibi)
or
$2^{10} \times 2^{10}$ frames ( gibi)
Or
$2^{20}$ frames ( gibi)

['frames' word optional in answer,
(6:1@) 4th word and answer optional)
1 mark]
(ii) The page table (data structure) keeps track of the pages (processes) in memory. It is used to determine the mapping between process pages and memory frames.

This data structure holds the mapping between process pages and memory frames.

[1 mark]

(iii) The virtual memory (virtual memory) makes it possible to use programs which are larger than the size of the physical memory (4GB).

The virtual memory technology makes it possible to use programs which are larger than the size of the physical memory (4GB).

[1 mark]

{Total for 4 (d) = 3 marks}
[TOTAL MARKS FOR Q4 10 MARKS]

**Important**

Information for Chief Examiners of the panels: Please fill the following table and include any amendments made at the chief controllers meeting held on 9th September.

<table>
<thead>
<tr>
<th>Check List</th>
<th>Question</th>
<th>Amende</th>
<th>Amendment Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2 (a) □
(b) □
(i) □
(ii) □
(iii) □
(iv) □

3 (a) □
(i) □
(ii) □
(iii) □
(iv) □
(v) □

4 (a) □
(b) □
(c) □
(i) □
(ii) □
(d) □
(i) □
(ii) □
(iii) □

***************
ICT 20 (English) -2018
Marking Scheme
Part B

Special Notes:

i.  .../.../... indicate only one of the options included are considered as one answer

ii. Underlined key words or synonyms are mandatory in a given answer

iii. [...] {} indicates marking guidelines

iv. If any amendments are made during 9th September 2018 meeting such changes need to be correctly written in the cages provided on page 54, 55 and verified with the panel/chieff examiner by the individual examiner

B අක්කාජය

i.  .../.../... ඉතිහාසීක සහ ඉතිහාසීක සංකීර්ණය අන්තර්ජාතීක පළමුව කිරීමට අනුව මෙහෙඳින් පෙන්බල විස්තරක

ii. අදාළ කෝපුන්ත, අදාළ මුදුන් මුදුන් ක්‍රියා මුදුන් ක්‍රියා (ක්‍රියාවක් ක්‍රියා කාරකයක් කාරකයක්)

iii. [...] {} ඉතිහාසීක සහ ඉතිහාසීක සංකීර්ණය විස්තරක

iv. 2018 කොතුමාළ ම 09 අග්‍රන්ත ප්‍රේමිති සහිතම පොළම්පොස් විස්තරකය කාරකය අතාකාරකය 54, 55. පරිමාණි අදාළ කෝපුන්ත හා අදාළ කෝපුන්ත හා අදාළ කෝපුන්ත අදාළ කෝපුන්ත කාරකය අතාකාරකය අතාකාරකය අතාකාරකය
Answers & Marking Guide:

1. A, B and C are inputs and Z is the output. Find the expressions for Z using Sum of Products and Product of Sums. (8 marks)

   (a) Z depends only on A, B, C.

   (b) Z depends only on A, C.

Truth Table for the output Z Truth Table / ආකාරයට ප්‍රශ්ඨාංගය Z පරිදියක් මොත්ත ප්‍රදේශය

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

[b) Z රෙණුව ප්‍රශ්ඨාංගයන් දිශයේ (ාත්මක ප්‍රශ්ඨාංගය) සහ ප්‍රශ්ඨාංගය ප්‍රශ්ඨාංගයන් (ාත්මක ප්‍රශ්ඨාංගය) එක ආකාරයට ප්‍රදේශය ප්‍රකාශය කරයි.

උත්සහය සිටිය 1

Option 1: Sum of products (SOP)

Using the 1-rows for Z, Z = \( \bar{A} \bar{B} \bar{C} + AB \bar{C} + \bar{A}BC + AB \bar{C} \)  

"Z = " (optional)

උත්සහය සිටිය 2

Option 2: Product of sums (POS)

Using the 0-rows for Z, Z = \( (A + \bar{B} + \bar{C})(\bar{A} + \bar{B} + \bar{C})(A + B + \bar{C})(\bar{A} + B + C) \)

[2 marks]

[No partial marks]
Method 1: Using Karnaugh map

Option 1: Start from SOP

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Simplified SOP: \( Z = A \bar{C} + B \bar{C} \)
Steps:
- Correct Karnaugh map \( \rightarrow 1 \) mark
- Correct marking of two groups (loops) \( \rightarrow 1 \) mark each \( \ast2 \) \( \rightarrow 2 \) marks

[3 marks]

Expected final answer:
\( Z = A \bar{C} + B \bar{C} \)
[2 marks]

[total for (c): 5 marks]

Option 2: Start from POS

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Simplified POS: \( Z = (A + C) \cdot (B + C) \)
Steps:
- Correct Karnaugh map \( \rightarrow 1 \) mark
- Correct marking of two groups (loops) \( \rightarrow 1 \) mark each \( \ast2 \) \( \rightarrow 2 \) marks

[3 marks]

Expected final answer:
\( Z = (A + C) \cdot (B + C) \)
[2 marks]

[total for (c): 5 marks]

Method 2: Using Boolean algebra

Option 1: Start from SOP

\[ Z = \bar{A}BC + A \bar{B}C + AB \bar{C} + ABC \]
\[ Z = A \bar{B}C + A \bar{B}C + \bar{A}BC + ABC \]
\[ Z = A \bar{C}(B + \bar{B}) + B \bar{C}(\bar{A} + A) \leftarrow 1 \) mark each for factorizing \( \ast2 = [2 \) marks\]
\[ Z = A \bar{C}(1) + B \bar{C}(1) \leftarrow 0.5 \) each for simplification \( \ast2 = [1 \) mark\]
\[ Z = A \bar{C} + B \bar{C} \leftarrow \) Expected final answer [2 marks]

[Steps 3 marks + final answer 2 marks, \( \rightarrow \) total 5 marks]

Option 2: Start from POS

\[ Z = (A + B + C)(A + B + \bar{C})(A + B + \bar{C})(A + B + C) \]
\[ Z = (A + B + \bar{C})(A + B + \bar{C})(A + B + C)(A + B + C) \]
\[ Z = (A + \bar{C})(B + B) \leftrightarrow (B + C)(A + \bar{A}) \leftarrow 1 \) mark each for factorizing \( \ast2 = [2 \) marks\]
\[ Z = (A + \bar{C})(1) \leftrightarrow (B + C)(1) \leftarrow 0.5 \) each for simplification \( \ast2 = [1 \) mark\]
\[ Z = (A + \bar{C})(B + C) \leftrightarrow \) Expected final answer [2 marks]

[Total for 1 (c): 5 marks]
Logic circuit

Option 1: Using 2-input logic NAND gates only

Can start from the simplified SOP expression, obtain AND-OR sequence, then convert that into NAND-NAND using De-Morgan’s Law

Option 2: Using 2-input NOR gate only

Can start from the simplified POS expression, obtain OR-AND sequence, then convert that into NOR-NOR using De-Morgan’s Law

2 marks if the number of NAND/NOR gates is higher than above, due to not utilizing De Morgan’s Law, but the circuit correctly implements the logic function for Z

-1 for each input or output not clearly and correctly labelled in the diagram (e.g., 3 out of 4 marks if the output is not labelled as Z; 0 out of 4 marks, if none of the 3 inputs and the output are labelled).

TOTAL FOR Q1 15 MARKS
2. සම්ප්‍රිය පුළුම් අන්යාළියේ සඳහා.

XYZ මුදෙලු ඕනාන්තයේ, 30 ක්. විස්තර මායිමේ, සිදුපුර හෝ පහත කරන්නේ සම්ප්‍රියව පුළුම් අන්යාළියේ පිළිබඳ ආකාරයක සාමාළිය නැත. ඇය නැති යන්නේ දර්ශකවලට අතර පැවතියේ ප්‍රශ්නය නිර්මාණය කිරීමට ලැබේ.

<table>
<thead>
<tr>
<th>අනුකාරයන්</th>
<th>සිදුපුරයේ</th>
<th>අභිඳුම්කාරයන්</th>
<th>සාමාළියභාවයේ</th>
<th>අභිඳුම්කාරයන්</th>
<th>සාමාළියභාවයේ</th>
</tr>
</thead>
<tbody>
<tr>
<td>D01</td>
<td>අත්‍යන්තර</td>
<td>30</td>
<td>අත්‍යන්තර</td>
<td>25</td>
<td>අත්‍යන්තර</td>
</tr>
<tr>
<td>D02</td>
<td>අත්‍යන්තර</td>
<td>30</td>
<td>අත්‍යන්තර</td>
<td>25</td>
<td>අත්‍යන්තර</td>
</tr>
<tr>
<td>D03</td>
<td>අත්‍යන්තර</td>
<td>30</td>
<td>අත්‍යන්තර</td>
<td>25</td>
<td>අත්‍යන්තර</td>
</tr>
<tr>
<td>D04</td>
<td>අත්‍යන්තර</td>
<td>30</td>
<td>අත්‍යන්තර</td>
<td>25</td>
<td>අත්‍යන්තර</td>
</tr>
<tr>
<td>D05</td>
<td>අත්‍යන්තර</td>
<td>30</td>
<td>අත්‍යන්තර</td>
<td>25</td>
<td>අත්‍යන්තර</td>
</tr>
<tr>
<td>D06</td>
<td>අත්‍යන්තර</td>
<td>30</td>
<td>අත්‍යන්තර</td>
<td>25</td>
<td>අත්‍යන්තර</td>
</tr>
</tbody>
</table>

බොහෝ ආකාරයන් අවශ්‍ය වියේ අන්යාළියේ විද්‍යාළුම් අදාලයේ බින්දුවේ කීරුම් (LAN) අවතර දෙකෙක් පවතී. නම්, සිදුපුරයේ අටක් මායිමේ 192.248.154.0/24 IP ප්‍රශ්නය දක්වා ගනිමා. නම්, බෙදුරු ආකාරයන් තුළ පහත පියවරණය සිදු ව෍යේ සමදියක් අයිතියන්ද, IP ප්‍රශ්නය කරුණාකරන්නේ (subnet) මායිමේ ප්‍රශ්නය.

(ii) IP ප්‍රශ්නය මියේතියේ ස්වරාජ අභිලේක් නිර්මාණය කිරීමට ලැබේ වේ?

First address: 192.248.154.0, Last address: 192.248.154.255

= 2 marks

(iii) උදාහරණ ස්වරාජ අභිලේක් නිර්මාණය (host) ක් කියන්න මෙහෙයේ බාල ද කි?

Three (03) host bits are required

(iv) ආකාරයන් නිර්මාණය කිය එය නැති යන්නේ සමදියක් අයිතියන්ද, කොහෝදුරු ආකාරයන් (subnet mask) මායිමේ කරුණාකරන්නේ බාල දෙකක් නිර්මාණය කිරීමට ලැබේ.

[1 mark]
<table>
<thead>
<tr>
<th>Department No</th>
<th>Network Address</th>
<th>Subnet Mask</th>
<th>IP Address Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>D01</td>
<td>192.248.154.0</td>
<td>255.255.255.224</td>
<td>192.248.154.0 - 192.248.154.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.1 - 192.248.154.30</td>
</tr>
<tr>
<td>D02</td>
<td>192.248.154.32</td>
<td>255.255.255.224</td>
<td>192.248.154.32 - 192.248.154.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.33 - 192.248.154.62</td>
</tr>
<tr>
<td>D03</td>
<td>192.248.154.64</td>
<td>255.255.255.224</td>
<td>192.248.154.64 - 192.248.154.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.65 - 192.248.154.94</td>
</tr>
<tr>
<td>D04</td>
<td>192.248.154.96</td>
<td>255.255.255.224</td>
<td>192.248.154.96 - 192.248.154.127</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.97 - 192.248.154.126</td>
</tr>
<tr>
<td>D05</td>
<td>192.248.154.128</td>
<td>255.255.255.224</td>
<td>192.248.154.128 - 192.248.154.159</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.129 - 192.248.154.158</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.161 - 192.248.154.190</td>
</tr>
</tbody>
</table>

[Each correct row 0.5 marks
0.5 x 6
= 3 Marks]

Two other possible entries for any of the department:

<table>
<thead>
<tr>
<th>Network Address</th>
<th>Subnet Mask</th>
<th>IP Address Range</th>
</tr>
</thead>
</table>

Alternative Solutions:
First divide (subnet) the IP address block into four equal subnets with 64 addresses of each

Allocate first two subnets (blocks) to two separate departments

Get third block and divide into two equal subnets of size 32 and allocate to two other departments

Get the last block of 64 address and divide into two equal subnets of size 32 addresses and allocate to the two remaining department.

<table>
<thead>
<tr>
<th>Department No</th>
<th>Network Address</th>
<th>Subnet Mask</th>
<th>IP Address Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>D01</td>
<td>192.248.154.0</td>
<td>255.255.255.192</td>
<td>192.248.154.0 - 192.248.154.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.1 - 192.248.154.62</td>
</tr>
<tr>
<td>D02</td>
<td>192.248.154.64</td>
<td>255.255.255.192</td>
<td>192.248.154.64 - 192.248.154.127</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.65 - 192.248.154.126</td>
</tr>
<tr>
<td>D03</td>
<td>192.248.154.128</td>
<td>255.255.255.224</td>
<td>192.248.154.128 - 192.248.154.159</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.129 - 192.248.154.158</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>192.248.154.161 - 192.248.154.190</td>
</tr>
</tbody>
</table>

Two other possible entries for any of the department:
Placing switches correctly and labeling.

[2 marks]

Connecting switches with cables and naming correctly

[0.5 + 0.5 marks]

Placing DNS server and Proxy server in the correct place

[0.5 + 0.5 marks]

[1 mark]
Placing router and firewall in the correct place and connecting them

[1 mark]

Showing the connection to the Internet

[1 mark]

(c) The network is not working. The firewall is damaged and the router is not working. DNS is not working (down)

- Proxy Server down
- Change the proxy settings
- Internet Link is not working (down)
- Switch is broken / No power for the switch
- Router is not working
- Cable damage / Cables not properly connected
- Network card of the computer is not working
- Computer is not properly connected to the network
- TCP/IP configuration of the machine is wrong
3. (a) \( \text{NIE Server down} \)

- DNS configuration is incorrect.
- Network configuration is incorrect.
- Network configuration is incorrect.
- E-mail server configuration is incorrect.
- E-mail server configuration is incorrect.
- Network configuration is incorrect.
- DNS configuration is incorrect.
- E-mail server configuration is incorrect.
- TCP/IP configuration is incorrect.
- NIE configuration is incorrect.

1 correct – 1 mark
2 correct – 1.5 marks
3 correct – 2 marks
maximum 2 marks]

[TOAL FOR 25 MARKS]

3. (a) (i) Business to Consumer/Business to Customer (e-business model)

\[ 1 \text{ mark} \]

(ii) \( \text{B2C/Business to Consumer is the} \) \( \text{model where} \) \( \text{the} \) \( \text{business} \) \( \text{company} \) \( \text{sells} \) \( \text{products} \) \( \text{or} \) \( \text{services} \) \( \text{directly} \) \( \text{to} \) \( \text{the} \) \( \text{consumer} \) \( \text{through} \) \( \text{an} \) \( \text{e-commerce} \) \( \text{website} \) \( \text{or} \) \( \text{store} \) \( \text{front} \) \( \text{counter} \).

\( \text{B2B/Business to Business} \)

\[ 1 \text{ mark} \]
Handicraft Business: Proposed e-business portal can earn revenue by sale of products. (Sales revenue model)

Hotel: Hotel can earn revenue by displaying handy craft business's advertisement on their web site and channeling traffic to the handicraft business site. (Advertising/affiliate revenue model)

Payment gateways (using credit cards/debit cards/using electronic payment cards online)/third party electronic payment processors such as PayPal/online fund transfer/using online banking fund transfer, can be used to process electronic payments via e-business portal.

Social media campaign (via Facebook, Twitter etc.)/ email campaign (direct mailing)/SMS campaign/advertising in other websites can be used to attract users to the proposed site/search engine marketing.
Intelligent agent technology can be used to suggest customer preferred products by analyzing customer behavior on site. Intelligent search functions can be provided to help user search through the products. For product recommendations on the site:

1. Intelligent agents can analyze customer behavior and customer preferences, and suggest products based on the analysis.
2. Intelligent search functions can help users navigate the products efficiently.

Yes, ☑️
as illustrated in the diagram an agent software has the ability to communicate with the user via the user interface (agent A and User) as well as the other agents as well as the in a multi-agent environment (agent A and Agent B without user interaction [self-autonomous]).

4. (a) Some students found that with the exception of all students, students with a score of more than 100 marks they got an .

\[ \text{Total for Q3 15 MARKS} \]
3 decision elements must exist: 3 marks for correct use of them, as follows (or equivalent):

- “is \( x = -1 \)” \( \rightarrow \) 1 mark (including correct Y and N connections)
- “is \( x > \text{max} \)” \( \rightarrow \) 1 mark (including correct Y and N connections)
- “is \( n < 100 \)” \( \rightarrow \) 1 mark (including correct looping / Y and N connections)

Correct initialization of variables: 1 mark
Correct update of max: 1 mark
Correct input and output: 0.5 marks
“start” and “stop”: 0.5 marks

Penalties applied after the above mark allocation:
if wrong flowchart symbols used, -1 for each wrong symbol

(Total for part (a) 7 marks,
(b) Determine if K is in L / output True if K is in L, False otherwise

\[ K, L \in \mathbb{N} \quad \text{and} \quad K \leq L \]

\[ K, L \in \mathbb{N} \quad \text{and} \quad K \leq L \]

(i) List elements (L) 23, 45, 32, 11, 67, 39, 92, 51, 74, 89

(ii) List elements (K) 38 \& 39, 74 \& 89

\[ i = L \& \text{ True} \]

\[ i = 0 \]

\[ L[i] = K \? \]

\[ i = i + 1 \]

\[ i < n \? \]

\[ \text{False} \]

\[ \text{output} \]

\[ \text{[1 mark]} \]

\[ \text{[2 marks No partial marks]} \]
Python program to implement the algorithm expressed by the flowchart.

```python
# ListSearch.py (Python version 3.x program)
# input: L (a list of numbers), K (a number)
# output: "True" if K is in L, "False" otherwise
L = input("Enter the list of numbers:")
numList = [int(i) for i in L.split()]  # or similar way
K = int(input("Enter K, item to search:")

n = len(numList)
i = 0
while i < n:
    if (numList[i] == K):
        print("True")
        break
    i = i + 1
if (not (i < n)):
    print("False")
```

[Loop must exist with correct looping and exiting/aborting of loop → 1 mark]

"if" must exist to compare each list element with K → 1 mark

```
L 0.5
K 0.5
```

Correct method to get input → 1 mark

Correct method to output → 1 mark

Overall correctness → 1 mark

Minor syntax errors will be ignored (not penalized)

Colon ":" and indentation are major (not minor) syntax

[Total = 5 marks]

Total for 4(b) 8 marks

[TOTAL FOR Q4 15 MARKS]
5. Draw an entity-relationship diagram for the given tables(CLASS, STUDENT) and explain the relationships.

### CLASS Table

<table>
<thead>
<tr>
<th>ClassID</th>
<th>ClassID</th>
<th>ClassTeacher</th>
<th>Stream</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1111</td>
<td>12 - A</td>
<td>A. B. Perera</td>
<td>Physical Science</td>
<td>2017</td>
</tr>
<tr>
<td>1112</td>
<td>12 - B</td>
<td>N. Mohamed</td>
<td>Bio Science</td>
<td>2017</td>
</tr>
<tr>
<td>1113</td>
<td>13 - A</td>
<td>E. Selvadurai</td>
<td>Arts</td>
<td>2017</td>
</tr>
<tr>
<td>1114</td>
<td>13 - B</td>
<td>L. de Silva</td>
<td>Commerce</td>
<td>2018</td>
</tr>
</tbody>
</table>

### STUDENT Table

<table>
<thead>
<tr>
<th>IndexNumber</th>
<th>ClassID</th>
<th>Initials</th>
<th>Surname</th>
<th>DateOfBirth</th>
</tr>
</thead>
<tbody>
<tr>
<td>8991</td>
<td>1112</td>
<td>E.</td>
<td>Nazeer</td>
<td>1999.12.06</td>
</tr>
<tr>
<td>8993</td>
<td>1111</td>
<td>S.</td>
<td>Sivalingam</td>
<td>1999.02.06</td>
</tr>
<tr>
<td>8995</td>
<td>1112</td>
<td>W.</td>
<td>Fernando</td>
<td>1999.11.11</td>
</tr>
<tr>
<td>8997</td>
<td>1113</td>
<td>U. H.</td>
<td>de Silva</td>
<td>1999.08.06</td>
</tr>
</tbody>
</table>

(a) \[ A \rightarrow B \] many to one \( 1:n \) \( n:1 \) \( N \) (cardinality) \( \Rightarrow \) \( A \) \( = \) \( B \) \( \Rightarrow \) many to one \( 1:n \) \( n:1 \) \( N \) (cardinality).

\[ A \rightarrow B \] \( \Rightarrow \) \( A \) \( = \) \( B \) \( \Rightarrow \) many to one \( 1:n \) \( n:1 \) \( N \) (cardinality).

(b) Primary key ClassID of CLASS table is used as the foreign key in STUDENT table.

---

**Partial Marks**

[2 marks of partial marks]
(c) (i) STUDENT and CLASS table are in 1NF as all fields are atomic and every non-prime attribute of each relation is fully functionally dependent on the primary key / primary key is not composite, hence all other attributes are fully functionally dependent on the primary key, and there are no partial dependencies / they are in 3NF as a transitive dependencies exists in addition to non composite primary key, hence in 2NF.

Yes, එබැබුපම්ම

Both STUDENT and CLASS table are in 1NF as all fields are atomic and every non-prime attribute of each relation is fully functionally dependent on the primary key / primary key is not composite, hence all other attributes are fully functionally dependent on the primary key, and there are no partial dependencies / they are in 3NF as no transitive dependencies exists in addition to non composite primary key, hence in 2NF.

(ii) එබැබුපම්මට දෙවන දින නිදසුන් දක්වාද.

- Data integrity and consistency is maintained hence database is (Atomicity, Consistency, Isolation, Durability) ACID compliant.
- No data duplication/ there is less chance of storing two or more different copies of the database/Smaller size database (By eliminating duplicate data, you will be able to reduce the overall size of the database.
- Data integrity/ no update, delete, insert anomalies/Data modification anomalies are reduced.
- Better performance faster access speed/ fewer indexes per table mean faster maintenance tasks such as index rebuilds/ Searching, sorting, and creating indexes is faster, since tables are narrower, and more rows fit on a data page.
- Conceptually cleaner and easier to maintain and change database.
- Updates run quickly due to no data being duplicated in multiple locations.
- Inserts run quickly since there is only a single insertion point for a piece of data and no duplication is required.
- Tables are usually smaller that the tables found in non-normalized databases. This usually allows the tables to fit into the buffer, thus offering faster performance.
• INSERT INTO CLASS VALUES (1115, '13 – C', 'A.B. Jinasena', 'Technology', 2018);

or

INSERT INTO CLASS VALUES ('1115', '13 – C', 'A.B. Jinasena', 'Technology', '2018');

or

INSERT INTO CLASS (ClassID, ClassName, ClassTeacher, Stream, Year) VALUES ('1115', '13 – C', 'A.B. Jinasena', 'Technology', '2018');
or

```
INSERT INTO CLASS (ClassID, ClassName, ClassTeacher, Stream, Year) VALUES (1115, '13 - C', 'A.B. Jinasena', 'Technology', 2018);
```

Statement structure correct (Correct keywords + correct field names + correct values)

2 marks;

Overall completeness (Correct keywords + correct field names + correct values+ correct use of quotes (either ' or " )+ semicolon(Exact Answer))

2 mark]

no other forms of partial marks

=total 4 marks

[TOTAL FOR Q3 15 MARKS]
6. (a) 0beda tevam obadevam gudam sidaram binu dawih. vadam byanam vsambo sas kud amal binu sampus

[Diagram]

- 'Sandram binu' awa fudam wabawise shaisham
- Adhikari adwinam adwinam
- Fudam wabawise shaisham

awihkumaw alaywum adwinam adwinam oba fudam wabawise shaisham asa asa da

Fudam wabawise shaisham oba fudam wabawise shaisham vsambo sas kud amal binu sampus

A- Application,
B- Application Acknowledgement/Acknowledgement
C- Eligibility Criteria
D- Request/Application for Electoral List
E- Electoral List
F- Request/Application for Residential Status/Confirmation of Residence
G- Residential Status/Confirmation of Residence
H- Acceptance/Rejection Status
I- Interview Letter/Interview Date, Time (Venue)
J- Interview Schedule
K- Interview Schedule

A-  
B-  
C-  
D-  
E-  
F-  
G-  
H-  
I-  
J-  

[Each correct ½ mark = 5 ½
+ ½ for completeness (all 11 are correct)
= 6 marks]

(b) (i) குறுக்கி வாயில்கள் ஒன்று முடிக்கும் பயிர் முடிக்கும் (functional) மற்றும் அந்தீன்கும் பயிர் முடிக்கும் (non-functional) செயல்களைச் சேர்க்கவும் முடிக்கும் முதல் என்று சொல்லப்படும்.

Functional requirements : Any requirement which specifies what the system should do or provide for users/ they related to the technical functionality of the system./ function is described as a specification of behavior between outputs and inputs/ behavior (output) that a device or software is expected to exhibit in the case of a certain input/ desired operations of a software, or system.
• Non-functional requirements: Any requirement which specifies how the system performs a certain function or system works. They describe how, how well or to what standard a function should be provided. Non-functional requirements describe the general characteristics of a system. They are also known as quality attributes. (Include service hours, service availability, responsiveness, throughput and reliability.) Define system attributes such as security, reliability, performance, maintainability, scalability, and usability.

1. Non-functional requirements: Describe the non-functional attributes and their importance to the user.

   - A. Performance: The speed of the system (characteristics) affects the user experience and user satisfaction.
   - B. Availability: The system should be available when needed (e-commerce) and should maintain the expected levels of quality.
   - C. Usability: The system should be easy to use and understand (catalogue).
   - D. Reliability: The system should function correctly over time (wish list).
   - E. Security: The system should be protected from unauthorized access (customized).
   - F. Scalability: The system should be able to handle increased load (customized).
   - G. Maintainability: The system should be easy to modify (customized).
   - H. Efficiency: The system should use resources efficiently (customized).
   - I. Portability: The system should be able to run on different hardware platforms (customized).
   - J. Reusability: The system should be able to reuse components (customized).

[2 * 2 marks = 4 marks, No partial marks less than 2 marks, Total= 4 marks]
**Important**

Information for Chief Examiners of the panels: Please fill the following table and include any amendments made at the chief controllers meeting held on 9th September.

<table>
<thead>
<tr>
<th>Check List</th>
<th>Question</th>
<th>Amended?</th>
<th>Amendment Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iv)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 (a)  
(i)  
(ii)  

(iii)  

(iv)  

(v)  

(b)  

4 (a)  

(b)  

(i)  

(ii)  

(iii)  

5. (a)  

(b)  

(c)  

(i)  

(ii)  

(d)  

6. (a)  

(b)  

(i)  

(ii)  

***************