අධ්‍යාපන පොදු සහතික පත්‍ර(උසස් පෙළ) විභාගය - පෙර පුහුණු - 2023
General Certificate of Education (A/L) Examination – **Pre Test - 2023**

තොරතුරු හා සන්නිවේදන තාක්ෂණය ii Information & Communication Technology ii	20	E	ii	පැය දෙකයි *Two Hours*

Answer to the all questions.

1. Student create an IOT application for small scale ground cultivation to pump water using drip irrigation. He has automated the function of water pump valve with inputs using three sensors. Wind speed sensor/anemometer(A) inputs (1) when wind speed higher than pre-defined value, Temperature sensor (B) inputs (1) when temperature higher than pre-defined value and Soil moisture level using Soil moisture sensor (C) inputs (1) when Soil moisture higher than pre-defined value are the input sensors. Pump valve will be open (Z=1) according to the following conditions.

   - ❖ if Soil moisture level lower than pre-defined value and wind speed or temperature higher than pre-defined value or,
   - ❖ if Both temperature and wind speed higher than pre-defined value then even Soil moisture level lower or higher than pre-defined value,.

   I. Construct the truth table for the output of Z.

   II. Write the SOP expression and POS expression for the output of Z.

   III. Draw the logic circuit for SOP and POS separately using only Basic logic gates.

   IV. Simplify the both SOP and POS expressions using Boolean algebra rules.

   V. Verify your answers for simplified SOP and POS, by simplifying them using K-Map.

   VI. Draw the logic circuit for simplified SOP and POS using only Basic logic gates.

   VII. Draw the logic circuit for simplified SOP and POS using NAND gates only.

   VIII. Draw the logic circuit for simplified SOP and POS using NOR gates only.

2. One company has ip address block of **192.168.16.192/26** and following computing resources.

Section	devices
A	5
B	10
C	6
D	15

   i. How many host IP addresses are possible with this IP range?

   ii. Find the 1 st and last IP addresses of the block?

   iii. Find the subnet mask, network IP, Broadcast IP, and valid host range to create the subnets for each sections in the company.

   iv. Draw a network diagram with using essential other components to represent the network given above. All sections have connected to the internet through section B.

3. Assume that a 512 KB program is running on a computer having 128 KB of physical memory. The page size of the system is 8 KB. Some rows of the page table of this process at a particular time is shown on the table here. Both page number and frame number given in decimal. And memory is byte addressable.

   I. Find the number of pages and frames created.

   II. Find the number of bits needed to represent page number and frame number separately.

   III. Find the offset of the page/frame.

   IV. Represent the logical address and physical address using number of bits used for number and offset.

   V. Assume processor need to access virtual address 8320. Represent the logical address in correct format and physical address which mapped according to the page table.

   VI. Virtual address at a particular time is 000 1000 0000 1010 1011. Find the physical address which mapped.

Page number	Frame Number	Present/ Absent
01	09	0
04	1	1
08	4	1
02	8	0
24	2	1
15	5	0
19	6	0
36	12	1

4. Consider the following description about the Community Health Processes carried out by Medical Officer of Health office (MOH).

Maternal and child health services primarily run by MOHs in Sri Lanka. Expectant females are should be registered in (MOH) office which she belongs, for antenatal care before 12 weeks of pregnancy. For this, She may came to the MOH office and obtain an application form from the Reception Clerk. When it is filled out then handed over it to the Reception Clerk. She will store it in the received application tray. The Midwife will take the application and go through the details of application and write the details on registration book and place the application in the entered application file and issue a registration card to the woman. A copy of that registration card is stored in the B card file as the B card. Then the women becomes a registered member of that (MOH). After registering, the Midwife notifies the member women to attend the various health seminar sessions on antenatal care.

Once a member woman becomes pregnant, she must be transferred from member women to a pregnant mother in the MOH office. Then midwife create a pregnancy note for her, and pregnancy note will give to the mother. Pregnant Mothers should be attend to medical check done by a doctor every month at the medical clinic of MOH office. When she comes to medical check, the midwife takes the pregnancy note from the mother and B card from the B card file and hand over it to the doctor. The doctor will record the health status of the mother on the pregnancy note and the B card, then puts it in the mother's details tray. After completing the session, midwife will hand over the pregnancy note to the mother and store the B card in the B card file too.

i. Draw a context diagram for the given scenario above. State any assumptions you have made.
ii. Draw a first-level data flow diagram for the given scenario above. State any assumptions you have made.
iii. Draw the level-2 data flow diagram for the location of Midwife and the interactions in the scenario above.

5. Leading school in a Gampaha is planned to setup a management database for the staff. Staff member can be categorized as academic staff and non-academic staff. Both categories can be uniquely identified using staffID. Staff member may have a name which consist of firstName, middleName, surname, Staff member may also have two or more phone numbers, email address, dateOfBirth, and living_city. Staff members can apply leaves. Leave has a unique LeaveID, Leave type. When staff member applying leaves, startDate, EndDate will be stored and numberOfDays will be calculated from it. Each Academic staff member has appointedSubject and serviceGrade while each Non-Academic staff member has appointmentType and agreementPeriod.

   Each Academic staff member is belongs to only one section in the school. Only One academic staff member from others in the section will be the Sectional Head in each section. Section has a unique sectionID, sectionName, and building.
   Each Non Academic staff member is assigned for each one field of work in the school. Field of Work may has fieldID, fieldname, equipment. One or more tasks are belongs to one field of work. Task may has unique TaskID, Tname, and Duration. Each Non Academic staff member is assigned to one or more tasks in any given field of work.

   i. Draw the ER diagram for the scenario given above.

   ii. Write the relational schemas for the ER diagram in question i.

   iii. Write SQL statements to do the following.

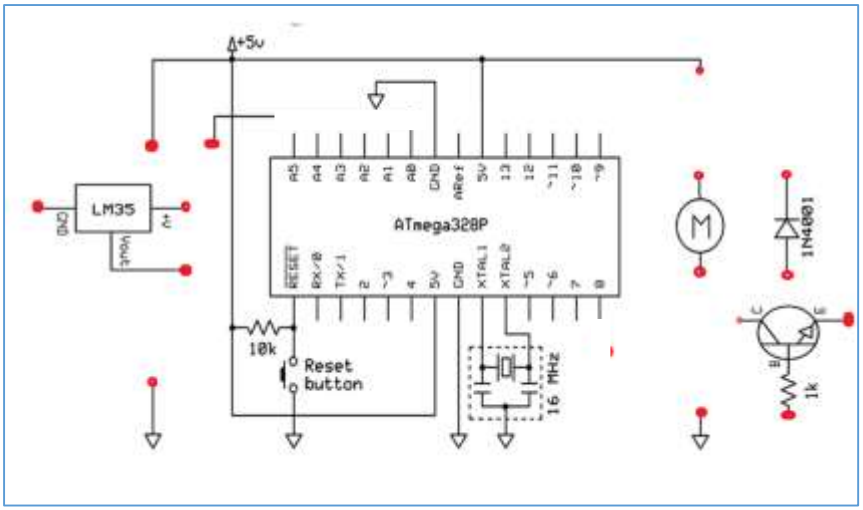
      a. Create the section Table with columns and necessary constraints.
      b. Create the Task Table with columns and necessary constraints.
      c. Add the column premises to the section table.
      d. Delete the column building from the section table.
      e. Add data (OL-01, grade_10, Rose area) to section table.
      f. Change the premises of AL-tec into “Mahindodaya” in section table.
      g. To select sectionName and the Premises of all sections in the school.
      h. To select firstname, surname , living city and the sectionname of the sectional heads in the school.

   iv. Consider the relations given below.

      A. Student(<u>indexNo</u>, stdName, telephone01,telephone02, teacherID, teacherName)
      B. Student_Class(<u>IndexNo, classID</u>, className, , captaincy)

         i. Name normalization form of relations given above. Prove your answer.
         ii. Convert those relations to next normal form.(only write relational schemas.)

6. Consider the schematic diagram and program code given below for embedded system developed using arduino microcontroller to turn ON a FAN connected to the motor when temperature is greater than 30 'C and answer the questions given below.




```
autofan §

const int snPin=A0;
const int mtPin=8;

void ..A..() {
  pinMode(mtPin, ..B..);
  Serial.begin(9600);
}

void..C...() {
  int snVal= ...D... Read(snPin);
  float v = snVal*5.0/1023;
  float temp=(v-0.5)*100;
  Serial.print("Temperature :");
  Serial.println(temp);
  if (temp>30)
    ....E....( ..F.. , ..G.. );
  else
    ....E....  ( ..F.. , ..H.. );
   delay(1000);
}
```

i. Connect the necessary components to complete the wiring diagram given above by observing the code given here.

ii. Fill In the blanks in the code with terms to complete the program for the embedded system.

iii. Name the functional components in the system above.
   a. Sensor :
   b. Actuator :
   c. Processor :

iv. Write the use of components given below, in the above project.
   a. LM 35 :
   b. IN4001 diode :
   c. BC 547 Transistor :
   d. 1K resistor :

v. What is the purpose of code line ***Serial.begin(9600);*** in the program above.

vi. Mention the type of the input and output in the project above.(state the digital or analog)

7. Build an algorithm (Flowchart/Pseudo code)and a python program to calculate and display the BMI value of each student and finally display the number of students with lower BMI value than 18.0 until user enter "0" for weight. The height and weight will be given by the user as keyboard inputs. User must be informed to enter weight in kilograms and height in meters. Weight, height, and BMI must be saved in different lists and finally it may be written to text file(named BMIdata.txt) as three lists. Hint for calculation:- [BMI =weight (kg)/height(m)^2]

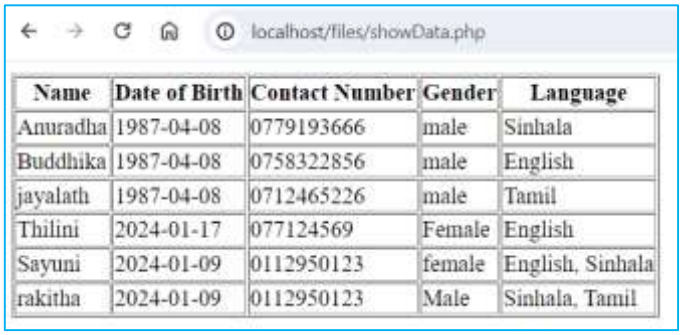
8. Consider the html given below created to get data to the database named studentInfo.
   I. Complete the html code given below to get the output.


```
<html>

<…….>

 <…….>User Information Form</……..>

</……..>

<……..>

<h2>User Information Form</h2>

<form ……..="submit_form.php" ……..="……..">

  <……t> <……> Basic Information </……..>

Name:

   <input type="……" ……..="name">

     <br> <br>


Date of Birth:

   <input ……..="date" ……..="dob" value="">          <br> <br>

Contact Number:

   <input ……="tel" ……="contact" value="" >          <br> <br>

 </……..>

<……> <……> Gender and Language </……>

Gender:

   <input type="……" name="……" ……..="male"  ……..>  Male

   <input type="……" name="……" ……..="female" >    Female  <br> <br>

Language Medium:  <br>

   <input type="……" ……..="lang01" ……..="english">  English<br>

   <input type="……" ……..="lang02" ……..="Sinhala">  Sinhala </label><br>

   <input type="……"  ……..="lang03" ……..="Tamil"> Tamil <br> <br>


      <input type="……." value = "……..">

      <input type="……." value = "……..">

</form>  </body>  </html>
```

ii. Complete the php script to connect to the database and input data into student table.

```
<?php
// Check if the form is submitted
if ($_SERVER["REQUEST_METHOD"] == "POST") {
    // Database connection details
    …….  = "localhost";
    ……. = "root";
    ……. = "";
    ……. = "schoolinfo";
    // Create connection
    ……. = new …….
($servername, $username, $password, $dbname);
    // Check connection
    if ($conn->connect_error) {
        die("Connection failed: " . $conn->connect_error);
    }
    // Creating variables for data insert
    $name = ($_…… ['……']);
    $dob = ($_…… ['……']);
    $contact = ($_…… ['……']);
    $gender = ($_…… ['……']);
// Handling multiple checkboxes for language
    $language = "";
    if (isset($_…… ['……'])) {
        $language .= "English, ";
    }
    if (isset($_…… ['……'])) {
        $language .= "Sinhala, ";
    }
    if (isset($_…… ['……'])) {
        $language .= "Tamil, ";
    }
// Remove the trailing comma and space if
any
    $language = rtrim($language, ", ");
    // Insert data into the database
    $sql = "……INTO …… (name,
dob, contact, gender, language) VALUES
('……, '……', '……',
'……', '……')";
    if ($conn->query(……) === TRUE) {
        echo "Record inserted successfully";
    } else {
        echo "Error: " . $sql . "<br>" . $conn-
>error;
    }
    // Close the database connection
    $conn->close();
}
?>
```

iii. Complete the php script to get data from the database and show as html table given below.

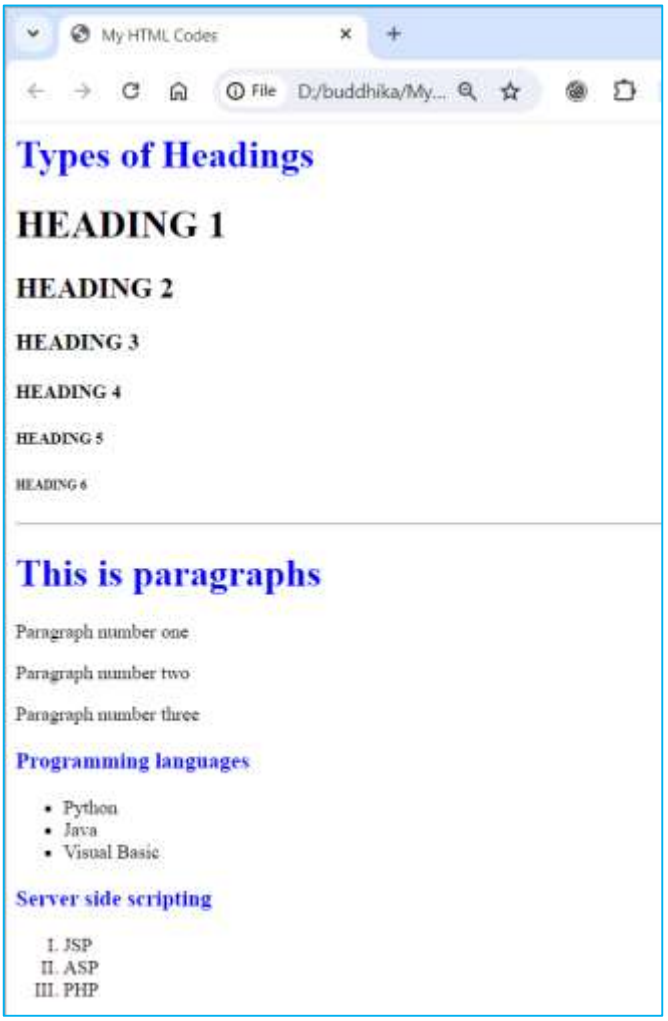


Name	Date of Birth	Contact Number	Gender	Language
Anuradha	1987-04-08	0779193666	male	Sinhala
Buddhika	1987-04-08	0758322856	male	English
jayalath	1987-04-08	0712465226	male	Tamil
Thilini	2024-01-17	077124569	Female	English
Sayuni	2024-01-09	0112950123	female	English, Sinhala
rakitha	2024-01-09	0112950123	Male	Sinhala, Tamil

```
<?php
// Check if the form is submitted
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   // Database connection details
   …….  = "localhost";
   ……. = "root";
   ……. = "";
   ……. = "schoolinfo";
   // Create connection
   ……. = new ……. ($servername, $username, $password, $dbname);
   // Check connection
   if ($conn->connect_error) {
      die("Connection failed: " . $conn->connect_error);    }
 // Select data from the database
$sql = "…… * FROM ……";
$result = $conn->query(……);
if (……->num_rows > 0) {
   // Output data of each row
   echo "<…… border='1'><tr><th>Name</th><th>Date of Birth</th><th>Contact
Number</th><th>Gender</th><th>Language</th></tr>";
   while ($row = $result->fetch_assoc()) {
      echo "<tr><td>" . …… ["……"] . "</td><td>" . …… ["……"] .
"</td><td>" . …… ["……"] . "</td><td>" . …… ["……"] . "</td><td>" .
…… ["……"] . "</td></tr>";
   }
   echo "</table>";
} else {
   echo "0 results";
}
// Close the database connection
$conn->close();
?>
```

iv. Consider the web page and part of html document given below. Fill the blanks necessary to apply the css. This web page has applied styles using styles.css external file and also with internal css.

```
<html><Head>
<TITLE>My HTML Codes</TITLE>
<link ……..=".……." ……..=".……."
……..="styles.css">
<……..>
ul {…… : ……;}
ol {…… : ……;}
</……..>
</Head>
<BODY>



</BODY>
</html>
```



a. External css file contain the styles for following requirements. Write content of the external css file.
   i. Make font colour blue as shows in the page with colblue class selector.

   ii. Change the background colour of the page to yellow using element selector.

b. Write Inline css to make the following changes for paragraphs.
   i. Change the Colour red, align to center the paragraph number one.