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Provincial Department of Education - NWP

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Third Term Test - Grade 13 - 2024

20 S II

Index No.: .....

Information And Communication Technology- II

03 hours

- **Answer <u>all questions in Part A</u> and <u>only four questions selected from part B.</u>**
- **Answer all the questions on <u>Part A itself.</u> Write your answers in the space provided for each question.**

Part A - Structured Essay

1. (a) Draw the expected output of the following HTML code segment when rendered by a web browser.

```
<html>
<body>
<ol>
<li>Tea
      <ul type="disc">
            <li>Black Tea</li>
            <li>Green Tea</li>
      </ul></li>
<li> Cofee </li>
</ol>
</body>
</html>
```

Note : Consider the following dotted line box as the display area of the browser.

(b) The login.php script is run after submitting the form in Figure 1. Figure 2 displays only part of the login.php script. Based on that, provide answers to the following questions.

Figure 1 - Form

```
<form action="login.php" method="post" >
      Name: <input type="text" name="stname"><br>
      Password: <input type="   password" name="pword"><br>
      <input type="submit" value="submit">
</form>
```

Figure 2 -login.php

```
<?php
$servername = "localhost"; $username = "root"; $password = " "; $dbname = "login";
$conn = new mysql($servername , $username,  $password, $dbname);
$name    =    $_....(A)....[`    ....(B)....'];    $password    =    $_....(A)....['....(C)....'];
?>
```

i. Fill in the blanks A, B, and C with appropriate terms.

(A) – .....

(B) – .....

(C) – .....

ii. Write an advantage of using "POST" as the form method attribute mentioned in Figure 1

.....

(c) It is expected to use the styles mentioned below in several web pages on a website. Write a suitable cascading stylesheet using a class selector with minimal code to satisfy this requirement.

selector	Description of the style
h1	Text align should be centered and text color shoud be red
p	Text align should be centered and text color shoud be red

.....

.....

.....

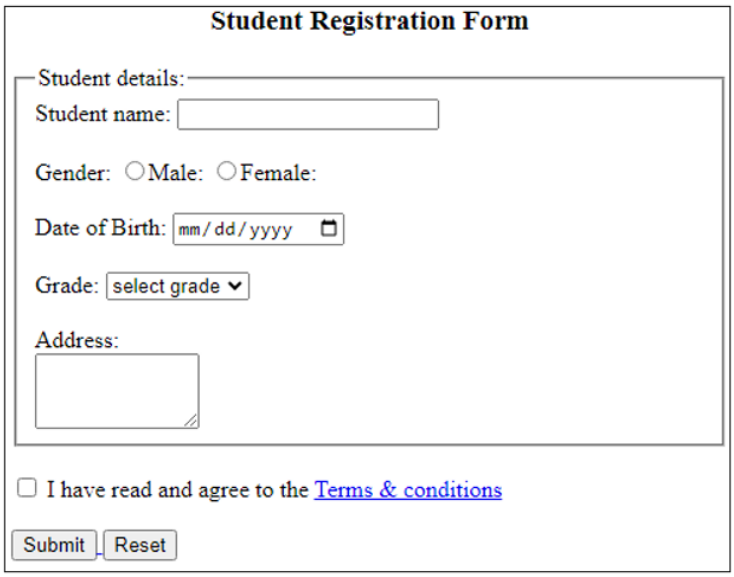
.....

.....

.....

(d) A student registration form and its labeled HTML source are given in Figures 3 and 4 respectively.

Figure 3



Figute 4

```
<html><body>
      <center><h3>Student Registration Form</h3></center>
      <form …Ⓐ… ="registration.php" method ="post" >
            <…Ⓑ… >
            <…Ⓒ… Student details:</…Ⓒ… >
            <label for="sname">Student name:</label>
            <input type="text" name="sname"><br>
            <label for="gender">Gender:</label>
            <input type= "radio" name="…Ⓓ… " value= "male">Male:
            <input type= "radio" name="…Ⓓ… " value= "female">Female:
            <br>
            <label for="dob">Date of Birth:</label>
            <input type="date"  name="date"><br>
            <label for="grade">Grade:</label>
            <…Ⓔ… name="class">
            <option value="12">12</option>
            <option value="13">13</option>
            <option value=""…Ⓕ… ="true">select grade</option>
            </…Ⓔ… ><br>
            <label for="address">Address:</label>
            <…Ⓖ… name="message" rows=3 cols=12 wrap="virtual"> </…Ⓖ…>
            </…Ⓑ…><br>
            <input type="checkbox" value="agree">
            <label for="agree">I have read and agree to the
            <…Ⓗ…  href="terms.html"> Terms & conditions</label><br>
            <input type="submit" value="Submit">
            <input type="reset" name= "reset" value="Reset">
</form></body></html>
```

For each of the labels Ⓐ to Ⓗ in the HTML code in Figure 4, choose a suitable replacement from the given list. In the answer table, write down the number of the replacement for each label.

List:

1: a	2: fieldset	3: female	4: selected
5: get	6: male	7: textarea	8: action
9: gender	10: legend	11: select	12: field set

Answer table:

Ⓐ:	Ⓑ:	Ⓒ:	Ⓓ:
Ⓔ:	Ⓕ:	Ⓖ:	Ⓗ:

2. (a) The expectation of creating information is carried out according to the data life cycle. Three stages of the data life cycle are provided below. Furthermore, actions that can be taken for each stage are provided as A, B, and C. Match the appropriate action to each stage of the data life cycle and write the **corresponding letter** in the blank space provided.

i. Data creation : .....

ii. Data management : .....

iii. Removal of obsolete data : .....

A. Data Encryption
B. Data Validation
C. Executing the delete command on records stored in a database

(b)

(i) Saman, Nimal, and Kamal are software engineers. They plan to develop an information system while remotely connecting from their homes. What cloud computing service model should they choose to make the development process most convenient?

……

(ii) There is potential to use nature-inspired computing based on Artificial Intelligence to solve complex problems where specific solution methodologies cannot be identified. Among the events A, B, and C below, which can be considered an application of nature-inspired computing? Write the corresponding letter in the blank space.

A. A system is used to identify the instances when wild elephants enter villages and their population during those instances.

B. A system that identifies the rate of deposition of plaque in blood vessels by studying the rate at which iron pipes corrode

C. A system that issues warning signals about tsunami hazards by studying the speed and height of waves in coastal areas.

……

(c) Select the most appropriate application for the following e-commerce business activities from the list provided in parentheses, and write the corresponding number in the blank space.

A. An application is submitted to the relevant government institution for registering a business, and the associated payment is made online. ……

B. Provides the opportunity to claim the lowest bid in an auction operating on an online website.

……

C. An e-commerce service application that facilitates direct payments made via credit cards.

……

List {1- C2G, 2 - B2G, 3- normal auction, 4- reverse auction, 5- Transaction processing systems, 6- payment gateway}

(c) (i) A friend of yours says that green computing refers to computers used to study the activities of natural forests. Briefly explain to your friend what green computing is.

.....

.....

.....

(ii) Mention two scenarios where Direct Input is used.

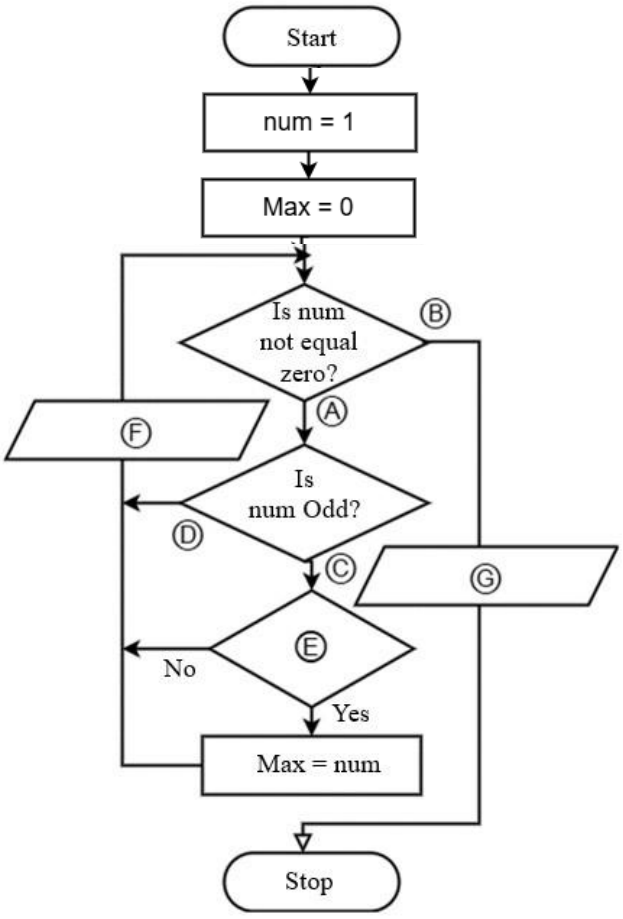
.....

.....

.....

3.

(a) Write down the most suitable replacements for labels Ⓐ to Ⓖ in the following flowchart, which is designed to return the largest odd number from a sequence of numbers entered until 0 is provided as input.



Ⓐ ……..

Ⓑ……..

Ⓒ……..

Ⓓ……..

Ⓔ……..

Ⓕ……..

Ⓖ……..

(b) (i) What is the output of following Python code.

```
def func (a, b):
    number_list= [ ]
    for i in range (a, b+1):
        if i%2==0:
            pass
        number_list. append(i)
    print(number_list)
func (5,20)
```

.....

(ii) Write down the output when the pass statement in the above Python code is changed to continue.

.....

(c) Write down the suitable replacements for the labels ❶ to ❻ in the Python code to find the smallest value in a set of integers and output the multiplication table of that value.

```
def fun1( Num_list ):
    Min_num=min ( ❶ )
    fun2( ❷ )
def fun2( num ):
    count=0
    while ❸ <12:
        count+=1
        c= ❹ *count
        print (num,' * ', count,' = ', ❺ )
numbers= (3,5,6,2,8,34,25)
fun1( ❻ )
```

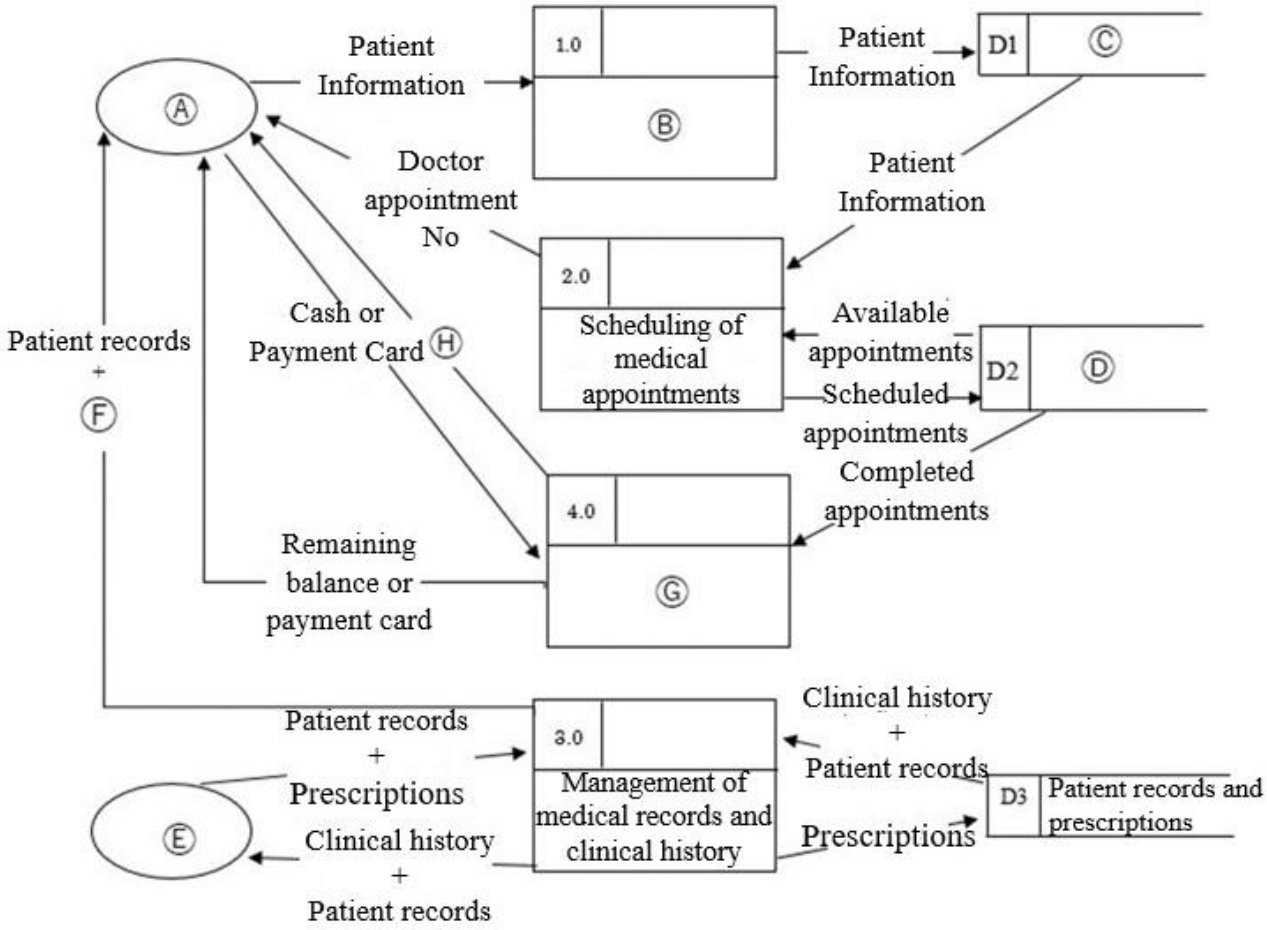
❶ ..... ❷ .....

❸ ..... ❹ .....

❺ ..... ❻ .....

4. "Suvasahana", a medium-sized private hospital with healthcare facilities, seeks to improve patient management and operational efficiency by implementing an upgraded hospital management system. By outsourcing the development of this system to a software development company, the hospital aims to streamline processes such as patient registration, medical appointment scheduling, billing, online payment facilitation, and the maintenance of patient medical records.

(a) The following is the data flow diagram (DFD) prepared for the above system.



A numbered list of replacements for the labels Ⓐ to Ⓗ are given below. Write down in the relevant box the number of the most suitable replacement for each of the labels given in the DFD.

List: {1. Bill processing, 2. Doctor, 3. Patient Information,
4. Invoice, 5. Patient, 6. Patient Registration,
7. Medical appointment schedule, 8. Prescriptions }

Ⓐ - ☐ Ⓑ - ☐ Ⓒ - ☐ Ⓓ - ☐

Ⓔ - ☐ Ⓕ - ☐ Ⓖ - ☐ Ⓗ - ☐

(b) If the session between the patient and the doctor is limited to a maximum of 10 minutes, write a relevant functional requirement to provide the patient number and time for each hour.

.....

.....

(c) Write a non-functional requirement that can help avoid long queues at the cash counter during payment, as counting and verifying the cash given by patients takes a lot of time, along with providing change.

.....

.....

(d) Give one factor that the development team should check when conducting the operational feasibility study of this project.

.....

.....

(e) What is the purpose of the acceptance testing conducted before implementing the Suwasahana Hospital Management System?

.....

.....

(f) The software development team proposes that the software be implemented in phases, and the hospital staff agrees that this approach is suitable. Write down one reason for the development team's suggestion and one reason for the hospital staff's acceptance of it

Software development team :- .....

.....

.....

The hospital staff :- .....

.....

.....

(g) Write down a potential issue that Suwasahana Hospital may face if it opts to use COTS (Commercial-off-the-shelf) software instead of developing this system.

.....

.....

Part - B

- **Answers any four questions only**.

5. (a). For an automated system, digital signal inputs are generated using three sensors named sensor 1 (A), sensor 2 (B), sensor 3 (C). The output signal R is generated by P and Q which are generated according to the signals received from these sensors.

- The P output signal is generated by the digital signal received by sensor 1 is pass through a NOT gate and then connected to the AND gate with the digital input which is received by sensor 2.
- The Q output signal is generated by the digital signal received by sensor 2 is pass through a NOT gate and then connected to the AND gate with the digital input which is received by sensor 3.
- R output signal is generated by connecting P and Q to the OR Logic circuit.

(i). Consider the above information and complete the truth table for output P, Q and R which are generated by the input digital signals of each sensor.

A	B	C	P	Q	R
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

(ii). Build the SOP (Sum of Product) Boolean expression for output R.

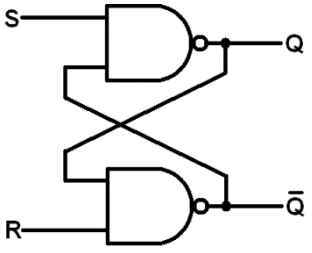
(iii). Simplify the Boolean expression which was built in (ii) above using the Karnaugh map.

(iv). Write down the appropriate Boolean expressions for the outputs P and Q using the simplified expression.

(v). Draw a logic circuit for the above simplified expression in (iii) by only using universal gates.

(b). Using the Boolean algebra, simplify the Boolean expression AB+A(B+C) + B(B+C).

(c). Consider the Flip - Flop given.



(i). Suppose that S= 1 and R=0. What is the output of Q?

(ii). If the R is changed to 1, What is the output of Q?

(iii). If the R= 1 and S=0, What will be the answer of Q?

6. (a). The business owner intends to network all the computers in the organization to increase the efficiency of his business organization. His requirement is as follows.

- Computers - 05
- Networking Printers - 01
- Providing internet facility to all computers.
- Protecting the network from unauthorized visitors.
- Controlling Internet Access.
- Using star topology to physically connect all devices.

(i). Write down 01 reason why the owner suggested star topology.

(ii). Write down 2 examples of network devices that can be used for centralized device in star topology.

(iii). Name the most suitable network device out of the examples you mentioned in (ii) and write down 01 reason for your selection.

(iv). Draw the logical layout of the network including the devices connecting to the topology that can be implemented to meet the requirements of the above organization.

(b). Suppose that a company has received the 192.186.60.128/25 IP address block to be distributed among 04 subnets as Subnet A, Subnet B, Subnet C, Subnet D. Each subnet needs to create same number of IP address.

(i). Write the subnet mask of the given IP address group in dotted decimal notation.

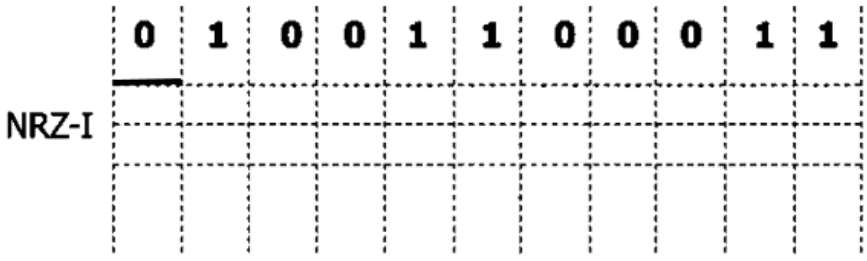
(ii). How many host bits are required to create the specified number of subnets?

(iii). Complete the table given below after subnetting.

Subnet	Network address)	First IP address	Last IP address	Broadcast Address
Subnet A				
Subnet B				
Subnet C				
Subnet D				

(c).(i) Explain the requirement of network address translation (NAP) to be accessed the internet.

(ii) Draw the digital signal pattern of 01001100011 in NRZ-I encoding method.



7. (a) *Note that you have received an Arduino (UNO) board with the following items.*

❶ - Read Switch

❷ - Piezo Buzzer

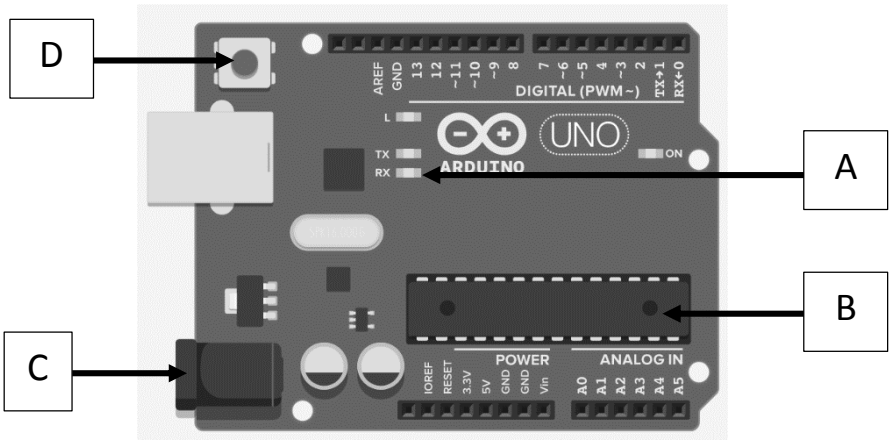


Figure: 7.1

(i). Write down the names of parts labeled A, B, C, D in figure 7.1 and briefly explain the task of each part.

(ii). Classify the component which are given above ❶ and ❷ as Actuators and sensors.

(iii). It is expected to build system using Above ❶ , ❷ components and Arduino board to be sound the alarmed when the door is opened. When only the door is opened alarm must be rung. Drow the rough diagram to show how the components are connected to the Arduino board.

(b). An e-channelling service Centre has a pool of agents employed, operating to receive and respond to requests from users.

The operation of that system is shown conceptually in Figure 7.2.

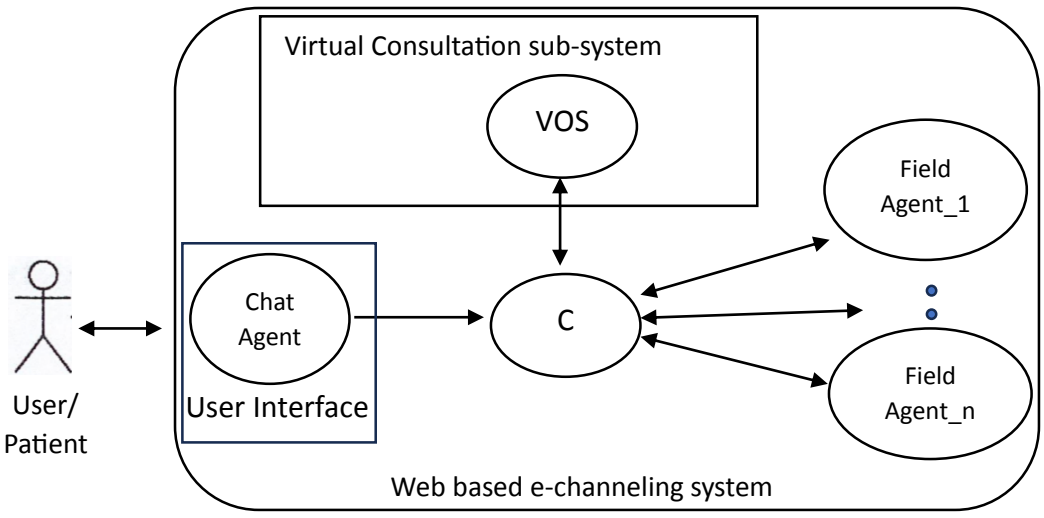


Figure 7.2.

A Chat Agent is deployed to inquire the needs of users (patients) accessing the website. After the Chat Agent inquiries about the user's needs, the information is forwarded to an interactive agent named C as shown in Figure 7.2. Agent C calls a field agent (Field agent) related to the patient condition to search for suitable doctors according to user needs.

If, according to the analysis of the information provided by the user, it appears that he or she is willing to engage with the Virtual Consultation service provided by this institution, the user may be referred to a Virtual Online Specialist (VOS) agent instead of a doctor by agent C.

When the user gets the opportunity to start the conversation with the VOS he/she directs his/her concerns to the VOS agent. In cases where the VOS is unable to respond to user issues, VOS seeks the assistance of virtual medical agents residing in other domains over the Internet. However, for unsolvable problems, C once again refers the user to a human doctor via the genetic method.

When the user needs human medical services by the agent, the chat agent or VOS agent checks the availability of suitable and approved doctors by considering the information provided and sends a related report to the user's mobile phone or email account.

(i) Classify the agents who are Among the agents operating in the above system, as Following A and B

A. An autonomous agent

B. A user agent

(ii) which agent can be considered as the **centralized agent** of the above system. Write down the reasons for your answer.

(iii) Outline an agent's performance in the above system that reflects a goal-oriented behavior, prioritizing cooperative performance over an agent's independent performance.

(iv) **"The system tends to maintain and control by centralized agents instead of multi-agent."** Explain the validity (true or false) of this statement with suitable examples.

(v) Draw a box-arrow diagram showing the interactions between the VOS A agents running in the above system, the virtual agents residing in other domains roaming the Internet, and the C agents. (In a box-and-arrow diagram, boxes indicate system components, and arrows indicate relationships between components.)

Part - B

8. (a) write down the output of following figure 8.1.

```
def function1(d_number):
    if d_number == 0:
        return "0"
        b_number = ""
    while d_number > 0:
        r = d_number % 2
        b_number = str(r) + b_number
        d_number = d_number // 2
        return b_number
d_number = 31
print(function1(d_number))
```

Figure 8. 1

(b) A group of students have prepared a list of their favorite fruits using the python. It is necessary to write a program to separate the name of each fruit, the number of times it is included in the list and enter it into a dictionary. The Python code written for the above requirement is shown in Figure 8.2.

Write suitable substitutes for its labels A to H.

```
def Ⓐ (students_fruit_list):
    fruit_counts = { }
    for fruit in Ⓑ:
        if Ⓒ in fruit_counts:
            Ⓓ+= 1
        else:
            fruit_counts[fruit] = Ⓔ
    return Ⓕ
students_fruit_list = [ "apple", "orange","banana", "apple", "apple", "grape"]
Ⓖ = count_fruit_likes(Ⓗ)
print(fruit_counts)
```

Figure 8.2

(c) The output of the above Python code should be stored in a file called fruit counts.txt as shown in Figure 8.4 below. The Python program is shown in Figure 8.3. Complete parts P and Q.

```
with open('fruit_counts.txt', 'w') as file:
    P
    Q
```

Figure 8.3

Example 'fruit_counts.txt' File

```
apple: 3
banana: 1
grape: 1
orange: 1
```

Figure 8.4

9. (a) Consider the following phenomenon

A software development company undertakes various projects from clients, and within a certain period of time, the projects are completed and returned to the respective clients.

Project development is done through several programmers in the company and any programmer can be involved in several projects. And there may be several method writers for a particular project. ProgrammerID is used to uniquely identify the programmer and National Identification Number (NIC), Programmer Name, Address, Gender and education Qualification are maintained as extra information.

Client Number (ClientID) to uniquely identify the client. The client's name (ClientName), address (Address), and phone number (Phone No) are used. A project is uniquely identified through the ProjectID and the Project Name, Start Date, EndDate and Cost are maintained as additional information. A project belongs to one client and a client can have multiple projects.

And to represent the above phenomenon, draw an entity relationship (ER) diagram by correctly identifying the entity attributes and relationships. Display primary keys correctly.

(b) Briefly explain Specialization and Normalization with reference to EER Diagrams.

(c) The following Exam Result database table is used to store the marks obtained by students for various subjects.

studentNo	NIC	firstName	lastName	subjectId	Grade	subjectName
S001	901531060v	Fathima	Rasik	ENG	A	English
S002	904123567v	Milan	Ekanayake	PHY	C	Physics
S001	901531060v	Fathima	Rasik	PHY	B	Physics
S003	914589698v	Dilan	Sampath	CHM	A	Chemistry
S004	908569963v	Gayan	Kumara	BIO	B	Biology

Note

- The subject is uniquely identified through the subject number.

(i) In which normal form does the Exam Result exist? Justify your answers.

(ii) Convert the Exam Result table to the next normal form (no need to write data in the tables).

(d) Consider the three database tables given below.

Customer

CustomerID	customerName	NIC
C001	Saman kumara	783696897V
C002	Sunil anthony	547896369V
C003	Anil perera	601236548V
C004	Susila wijebandara	795689789V

Product

productID	ProductName	stock
P001	cement	150
P002	box bar	100
P003	paint	450
P004	bucket	200

Purchase

customerID	productID	Amount	date
C002	P001	10	2024/05/12
C001	P003	4	2024/05/12
C001	P002	12	2024/05/12
X004	P001	50	2024/05/13

(i) Write the required SQL statement to add a new field called Telephone No to the above Customer table.

(ii) Write down the output of executing the following SQL statement.

```
SELECT customer.customerName,Purchase.Amount,date FROM Customer, Purchase

WHERE customer.customerID=Purchase.customerID AND

purchase.productID=”P001”;
```

(iii) Write a SQL query to get the number of customers who have purchased the product with respect to the date 12/05/2024.

10. (a) (i) Which software component facilitates the control and management of communication by acting as an intermediary between the operating system and hardware devices?

(ii) In the central processing unit, which register is responsible for temporarily holding the fetched instructions in memory before they are decoded and executed?

(iii) The following are statements that describe the operations that take place when a computer is booted. Write these statements in correct order. (Just writing the labels is enough)

A - Bootloader will run and locate the operating system.

B – Power on self-test (POST) program. Checks for the Central processing unit, memory, operation of the Basic Input/Output System (BIOS) and other hardware components.

C - Provides the user interface when the operating system starts running and performs driver access, file system management, user authentication, etc.

D - The basic I/O system copies operating system files to main memory.

(b) (i) The exam.py program running on a computer at time I stops the context switch at time T+1 and the final.py program, which has a higher priority, starts running. Write the action transition in this scenario according to the following format.

Process	**Time (T)**		**Time T+1**
exam	.....	→	.....
final	.....	→	.....

(ii) Describe the task performed by the operating system during the context switching that occurs in the above description in terms of the data structure called process control block.

(iii) At a certain point, the final operation moves from the "running" state to the "blocked" operation. Write down one reason that could lead to such a shift.

(c) A user runs a file named X whose size is 64 KB on a computer having 64 KB of physical memory. The size of a system page is 4 KB and bytes are referenced. At a given time, some selected fields in the page table of operation X, how the memory pages of operation X are located in a segment of virtual memory, operating system (OS) in main memory, operation X (x1, x2,.....) and operation Y (yl, y2,....) The memory frames used by the operation are also illustrated below.

Virtual Memory

	Page Number
x1	0
x2	1
x3	2
x4	3
x5	4
x6	5
x7	6
x8	7
x9	8
x10	9
x11	10

Page Table

Page No	Frame No	Yes/No
0		
1		
2		
3		
4		
5		
6		

Main Memory

	Frame Number
OS	0
OS	1
x4	2
x7	3
x6	4
y4	5
x2	6
x5	7
y3	8
y1	9
y2	10

Part - B

Note: - The yes/no bit indicates the validity of that row. If the bit is 1, the input is valid and can be used. If the bit is 0 then the corresponding virtual page is not in physical memory.

(i) Write down the memory frames used by the operating system, process X and process Y separately? (Express as a decimal.)

(ii) In this computer, how many bits of reference are required to store the frame number?

(iii) Complete the page table of Activity X above. (Indicate the frame number as binary.)

(iv) Assume virtual reference 00 0000 0000 0000 1100 was required. As a result of processes initiated by the operating system to fulfil that requirement, the yes/no bit related to page number 5 in the page table above changed from 1 to 0.

(v) How many pages available in virtual memory?

(d) File Partition Table (FAT) is used for storage management in a particular computer. The file named practical.py is stored on the disk in the order of blocks 322, 320, 323 and 321. The disk uses groups with a size of 4KB.

(i) operating system checks directory entries to be found the blocks related to the practical.py. Write down a numerical value which is in the directory entries related to the file and important to the operating system.

(ii) If the size of the practical.py file is 14KB, how much of the batch is wasted due to its internal fragmentation?

(iii) If the size of the practical.py file is 11KB due to an edit, show the FAT contents related to this file by means of a diagram. (The last category of a file is indicated by - 1.)