AL/2021(2022)/20/E-I

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021(2022)
General Certificate of Education (Adv. Level) Examination, 2021(2022)

තොරතුරු හා සන්නිවේදන තාක්ෂණය I தகவல், தொடர்பாடல் தொழினுட்பவியல் I **Information & Communication Technology I**	**20 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் ***Two hours***

Instructions:

* *Answer* ***all*** *the questions.*
* *Write your* ***Index Number*** *in the space provided in the answer sheet.*
* *Instructions are also given on the back of the answer sheet. Follow those carefully.*
* *In each of the questions* **1** *to* **50**, *pick one of the alternatives from* (1), (2), (3), (4), (5) *which is* ***correct or most appropriate*** *and* ***mark your response on the answer sheet with a cross*** (×) ***in accordance with the instructions given on the back of the answer sheet.***
* *Use of calculators is* ***not allowed.***

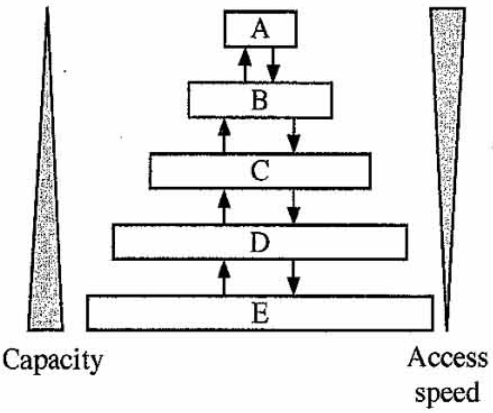
1. Which of the following pairs contains types of software that are **different** with respect to *ownership / licensing*?

(1) Application software and open-source software
(2) Application software and utility software
(3) Proprietary software and open-source software
(4) Proprietary software and systems software
(5) Systems software and utility software

2. Which of the following is a good example for *batch processing*?

(1) an air traffic control system
(2) driving system in a driver-less (autonomous) car
(3) Intensive Care Unit (ICU) patient monitoring and care system
(4) payroll system
(5) nuclear plant control system

3. There are different storage components which vary in capacity and access speed.
Consider that the shown diagram portrays capacity and access speed variation of the storage components *L1 cache*, *L2 cache*, *main memory*, *registers* and the *hard disk*. The capacity increases and access speed decreases from top to bottom, as shown.



Which is correct with respect to the A, B, C, D and E above?

(1) A – hard disk, B – registers, C – L2 cache, D – L1 cache, E – main memory
(2) A – L1 cache, B – L2 cache, C – registers, D – hard disk, E – main memory
(3) A – main memory, B – registers, C – hard disk, D – L1 cache, E – L2 cache
(4) A – registers, B – L1 cache, C – L2 cache, D – main memory, E – hard disk
(5) A – registers, B – main memory, C – L2 cache, D – L1 cache, E – hard disk

[See page two

4. Consider the following paragraph:

To run a program, the program code is copied from .....A..... into .....B..... The Central Processing Unit's (CPU's) *program counter* register is set to the memory location where the first instruction of the program has been saved and execution of the program starts. The .....C..... implements the fetch – decode – execute cycle.

Which of the following is the correct combination for A, B and C?

(1) A – CPU, B – primary memory, C – secondary storage
(2) A – CPU, B – secondary storage, C – primary memory
(3) A – primary memory, B – secondary storage, C – CPU
(4) A – secondary storage, B – CPU, C – primary memory
(5) A – secondary storage, B – primary memory, C – CPU

5. What is the correct result of bit-wise XOR operation between the two binary numbers 01011100_2 and 11111001_2?

(1) 00000010 (2) 01011000 (3) 01011010 (4) 10100101 (5) 11111101

6. What is the correct 2's complement binary representation of decimal -32_{10} using 8-bits?

(1) 00100000 (2) 10100000 (3) 11011111 (4) 11100000 (5) 11100001

7. What is the correct decimal equivalent of hexadecimal 88.8_{16}?

(1) 88.5_{10} (2) 88.8_{10} (3) 129.5_{10} (4) 136.5_{10} (5) 136.8_{10}

8. A particular command can be used to output the values of every byte in a file in decimal format. Assume a file contains the following text:

Love trees!

Referring the two **Notes (i)** and **(ii)** given below, select the correct output that will result when the said command is run on that file.

(1) 76 111 118 101 32 116 114 101 101 115 10
(2) 76 111 118 101 116 114 101 101 115 33 10
(3) 76 111 118 101 32 116 114 101 101 115 33 10
(4) 108 111 118 101 116 114 101 101 115 33 10
(5) 108 111 118 101 32 116 114 101 101 115 33 10

Notes:

(i) Some selected rows from the ASCII table are given below:

Decimal	Character
10	(LINE FEED)
32	(SPACE)
33	!
76	L
101	e

Decimal	Character
108	l
111	o
114	r
115	s
116	t
118	v

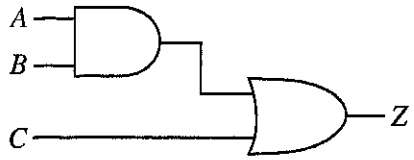
(ii) The file ends with a LINEFEED character.

[*See page three*

9. Consider the following Karnaugh map and the logic circuit implemented based on it where A, B and C are the inputs and Z is the output:

C \ AB	00	01	11	10
0	0	e	f	0
1	1	g	h	1

(*a*) Karnaugh map

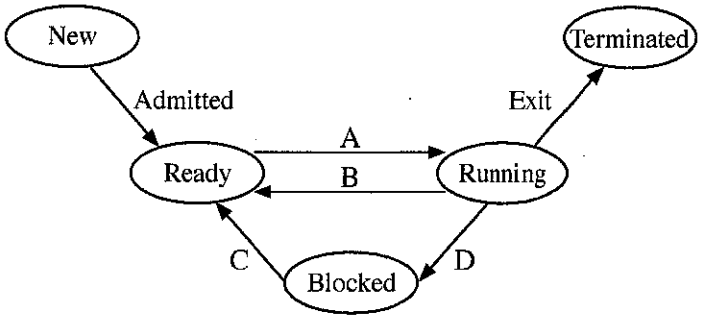


(*b*) Logic circuit based on Karnaugh map

For the logic circuit to correctly implement the logic function represented in the Karnaugh map, what should be the values of **e**, **f**, **g**, **h**?

(1) e=0, f=0, g=1, h=1
(2) e=0, f=1, g=1, h=1
(3) e=1, f=0, g=1, h=1
(4) e=1, f=1, g=0, h=0
(5) e=1, f=1, g=0, h=1

10. Amara logs into a single-processor computer and starts a program to work on his presentation. He opens up a web browser too to get some information as well.
Consider the following process state transition diagram with respect to the process corresponding to Amara's **presentation program.**



Consider some reasons for above state transitions:

Reason	Description
1	Amara saving his presentation on the hard disk
2	Operating system scheduling the presentation process to run on the processor
3	Operating system suspending the presentation process to let the web browser process to run on the processor
4	The finishing of saving the presentation on the hard disk

Which of the following gives a correct combination of reasons for transitions A to D?

(1) A – 1, B – 2, C – 3, D – 4
(2) A – 2, B – 3, C – 4, D – 1
(3) A – 3, B – 4, C – 1, D – 2
(4) A – 4, B – 1, C – 2, D – 3
(5) A – 4, B – 1, C – 3, D – 2

11. A *page table* is

(1) a computer hardware unit through which all memory references pass.
(2) a data structure that keeps information about the pages that are in processor caches.
(3) a hardware component in memory that facilitates page movement.
(4) an operating system data structure that keeps virtual to physical address mapping of a process' pages.
(5) a piece of processor hardware that keeps a count of the number of pages of a process that are in virtual memory.

[*See page four*

12. The *block size* of a disk is 4KB. A portion of its **File Allocation Table (FAT)** at a particular time is shown below. The portion shown gives the blocks of the *myprog.py* file as well.

FAT

100	101
101	–1
102	
103	100
104	

Notes: **1.** The last block of a file is indicated by –1.

2. The *directory entry* of a file contains the block number of the first block of the file.

Which of the following gives the *directory entry* for the *myprog.py* file **and** the disk space allocated for the *myprog.py* file respectively?

(1) 100, 12KB (2) 101, 12KB (3) 101, 16KB (4) 103, 12KB (5) 103, 16KB

13. Which of the following is/are correct with respect to a *digital signal*?

A – denoted by a square wave
B – contains a continuous range of values
C – uses discrete values to represent information

(1) A only (2) B only (3) C only
(4) A and B only (5) A and C only

14. Which of the following is/are correct with respect to *guided media* used for data transmission?

A – a physical path is used for data transmission
B – signal is broadcast through air
C – Example: radio waves

(1) A only (2) A and B only (3) A and C only
(4) B and C only (5) All A, B and C

15. Which of the following could be used to digitally represent analog signals?

(1) attenuation (2) decoding (3) distortion
(4) pulse code modulation (5) synchronization

16. Read the following sentence:

When devices send and receive data over a network, a protocol is used uniquely identify the sender interface and the correct delivery of the data to the receiver's interface.

What is the protocol that the writer in above sentence is referring to?

(1) FTP (2) HTTP (3) MAC (4) TCP (5) UDP

17. Given below are some characteristics of *Transmission Control Protocol (TCP)* and *User Datagram Protocol (UDP)*:

A – best suited for applications that need high reliability and where the transmission time is less critical
B – faster and requires fewer resources
C – guarantees that no packets are missing
D – packets may not arrive in order
E – used for voice communications over internet

Which of the above are the characteristics of **UDP**?

(1) A, B and C only (2) A, C and E only (3) A, D and E only
(4) B, C and D only (5) B, D and E only

[*See page five*

18. Which of the following is/are examples for the use of the *Client-Server* model?

A – A user printing a document using a printer connected to her computer
B – A bank customer accessing online banking services with a web browser
C – A cashier of a shop that accepts payments by credit cards

(1) A only (2) B only (3) C only
(4) A and C only (5) B and C only

19. Sender A wants to send the message HELLO to receiver B. Before sending the message, it is converted to IFMMP. Which of the following is correct with respect to this scenario?

A – HELLO is the *plaintext* while IFMMP is the *ciphertext*.
B – IFMMP is the result of applying the ASCII code to HELLO.
C – +1 is the *encryption key* while –1 is the *decryption key*.

(1) A only (2) A and B only (3) A and C only
(4) B and C only (5) All A, B and C

20. Consider the following paragraph with three blanks labelled A, B and C:

When there are multiple computers in an office, each computer can be given a private IP address. The router in the office gets a .....A..... IP address, and each of the computers connected to that router through guided/unguided media gets a private IP address from the .....B..... via the .....C..... protocol.

Which of the following is the correct combination for the blanks A, B and C?

(1) A – private, B – file server, C – HTTP
(2) A – private, B – Internet, C – DHCP
(3) A – private, B – router, C – FTP
(4) A – public, B – file server, C – FTP
(5) A – public, B – router, C – DHCP

21. Consider the information system types in **List A** and some examples in **List B**:

List A	List B
A1 – Enterprise Resource Planning System	**B1** – A customer account system in a bank
A2 – Expert system	**B2** – A system that facilitates manufacturing, marketing and sales of a garment business
A3 – Transaction processing system	**B3** – A system that prescribes ayurvedic medicines using a knowledge base

A good matching between lists **A** and **B** is:

(1) A1-B1, A2-B2, A3-B3 (2) A1-B2, A2-B3, A3-B1
(3) A1-B3, A2-B1, A3-B2 (4) A1-B2, A2-B1, A3-B3
(5) A1-B3, A2-B2, A3-B1

22. Which of the following is **incorrect** about the *Agile Method*?

(1) It cannot be used when the project has a fixed set of requirements.
(2) It recommends a time sliced schedule for task completion.
(3) It delivers gradual builds of the working product in an iterative manner.
(4) It facilitates stakeholders (e.g., buyer, user) to review progress and provide feedback at every phase.
(5) The product of each build is tested independently.

[See page six

23. Which of the following statements is/are correct with respect to *Object Oriented Programming*?

A – System output is determined by the object behaviour and their interactions.
B – System is modelled as a collection of objects.
C – Writing a program in this method is different from writing one according to the *structured programming* method.

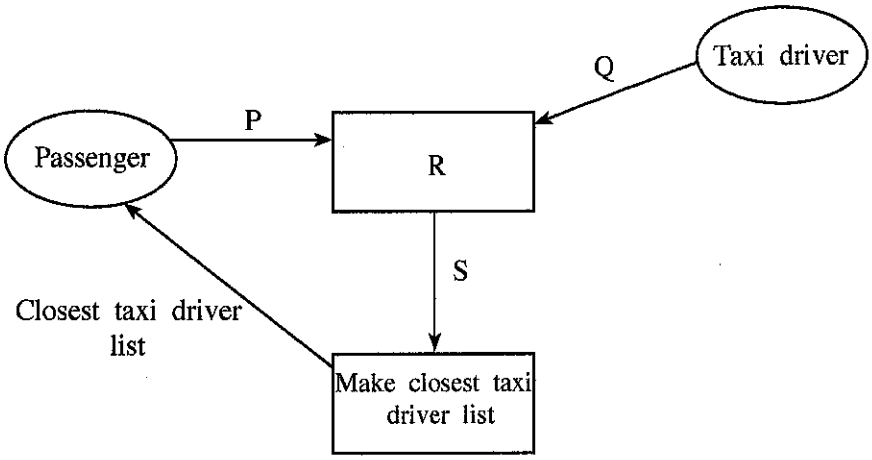
(1) A only (2) B only (3) C only
(4) A and C only (5) All A, B and C

24. Which of the following lists the activities of Structured System Analysis and Design Methodology (SSADM) in the correct order?

(1) Feasibility study, Physical design, Requirement analysis, Requirement specification, System development
(2) Feasibility study, Requirements analysis, Requirement specification, Logical system specification, Physical design
(3) Feasibility study, Requirement specification, Requirements analysis, Logical system specification, Physical design
(4) Requirements analysis, Logical system specification, Feasibility study, Requirement specification, Physical Design
(5) Requirements analysis, Requirement specification, Feasibility study, Physical design, System development

● A system that gives the list of closest taxi drivers to a passenger is to be developed. Answer questions **25** and **26** with respect to it.

25. Assume that the following is the *Level 1 DFD* for this system:



Which of the following contains the suitable replacements for P, Q, R and S in the above diagram?

(1) P – Location, Q – Driver code, R – Get passenger and driver locations, S – Passenger and driver locations
(2) P – Location, Q – Driver code and location, R – Get passenger and driver details, S – Passenger and driver details
(3) P – NIC number, Q – NIC number, R – Get passenger and driver NIC numbers, S – Passenger and driver NIC numbers
(4) P – Passenger code, Q – Driver code, R – Get passenger and driver codes, S – Passenger and driver codes
(5) P – Passenger code, Q – Location, R – Get passenger and driver locations, S – Passenger and driver locations

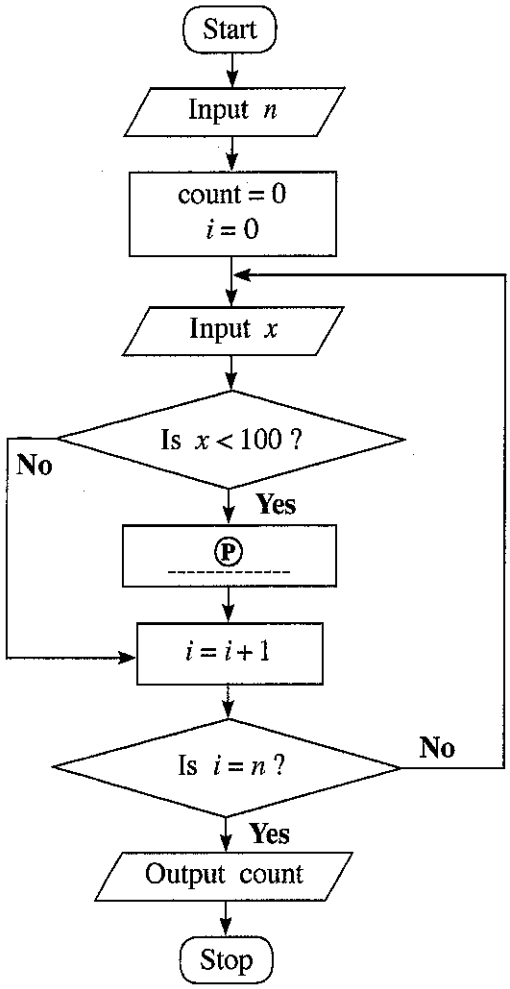
26. Above Level-1 DFD was later improved so that a data store (D1) was connected to the process labelled R. What could be this data store?

(1) NIC data (2) Passenger details (3) Taxi driver details
(4) Travel cost details (5) Weather records

[*See page seven*

- Consider the algorithm expressed by the flowchart and answer questions **39** and **40**.

This algorithm takes as input first an integer n (≥ 1) followed by a sequence of n integers one by one. The algorithm is expected to output the count of integers that are less than 100 among the sequence of n inputs.



39. For the algorithm to function correctly as expected, what should be inserted at the blank Ⓟ ?

(1) count = count + 1
(2) count = count + i
(3) count = count + x
(4) n = n – 1
(5) n = n + 1

40. Which of the following Python programs implement the algorithm in the flowchart?

I
```
n = int(input())
count = 0
for i in range(n):
        x = int(input())
        if (x < 100):
                count = count + i
print(count)
```

II
```
n = int(input())
count = 0
for i in range(n):
        x = int(input())
        if (x < 100):
                count += 1
print(count)
```

III
```
n = int(input())
count = i = 0
while (i < n):
        x = int(input())
        if (x < 100):
                count = count + 1
print(count)
```

(1) Only I (2) Only II (3) Only I and II
(4) Only II and III (5) All I, II and III

[See page eleven

36. Following are the steps involved in creating an *Entity Relationship* (ER) *Diagram*:

I. Determine the .....**A**..... in your diagram.
II. Add ....**B**.... to each ....**C**....
III. Include the ....**D**.... between the ....**A**....
IV. Add ....**E**.... to every relationship

Which of the following gives suitable choices for the **A**, **B**, **C**, **D** and **E** blanks in the above steps?

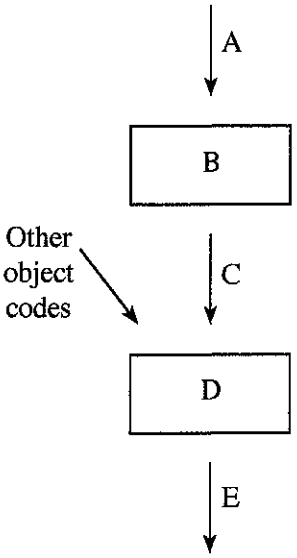
(1) A – attributes, B – entities, C – attribute, D – cardinality, E - entities
(2) A – attributes, B – cardinality, C – attribute, D – entities, E- entity
(3) A- entities, B – attributes, C – entity, D – relationships, E – cardinality
(4) A- entities, B – relationship, C – entity, D – attributes, E – cardinality
(5) A – relationships, B – cardinality, C – relationship, D – attributes, E – entities

37. Which of the following can be modelled with an *Extended Entity Relationship* diagram?

A – subclasses of an entity
B – inheritance of attributes
C – specialization of entities

(1) A only (2) B only (3) C only
(4) A and C only (5) All A, B and C

38. A teacher of a programming class draws the following diagram and asks the students to identify the components indicated by A, B, C, D and E:



Which of the following gives the correct choices for A, B, C, D and E?

(1) A – compiler, B – executable code, C – source code, D – linker, E – object code
(2) A – compiler, B – source code, C – executable code, D – object code, E – linker
(3) A – linker, B – source code, C – object code, D – executable code, E – compiler
(4) A – source code, B – object code, C – linker, D – compiler, E – executable code
(5) A – source code, B – compiler, C – object code, D – linker, E – executable code

[*See page ten*

6. (a) *Parity Check* is a simple technique to detect errors in data communications.

Assume the seven bits 1010110 need to be transmitted. Explain how the odd parity check can be performed to detect any error in its transmission. **[02 *marks*]**

(b) The **ABC company** has two main divisions, namely **Production** and **Marketing**. Under the **Production** division, there are three units, namely **Stores**, **Supplies** and **Operations** having 10, 12 and 18 computers, respectively. **Marketing** division has 40 computers. ABC company has been given the 192.174.19.0/25 IP address block. All the computers of the ABC company are to be assigned IP addresses after making the subnets from this address block.

The following incomplete table shows the sub-netting. Copy it to your answer sheet and fill the empty entries.

Division/ Unit	Network ID	Broadcast ID	Subnet Mask	No. of Nodes	Usable IP Address Range
Marketing	192.174.19.0			64	
Stores		192.174.19.79		16	
Supplies	192.174.19.96			16	
Operations		192.174.19.159		32	

[06 *marks*]

(c) Mohan has ten (10) desktop computers and a router having 2 ports with a 64 Mbps Internet connection. Each computer has an adequate number of network interface cards. He also has a sufficient number of RJ 45 connected twisted pair cables.

Mohan wants to start an Internet Browsing Center with the above equipment and seeks your advice for it. He informs you that he is not in a position to invest money for any new equipment.

(i) Which network topology will you suggest for Mohan? **[01 *mark*]**

(ii) Draw the logical arrangement of the network that you propose. **[02 *marks*]**

(iii) Mohan would like to improve the connection speed to the clients while saving the existing bandwidth of the Internet connection. Further he needs to have the control of the Internet access while ensuring the privacy of the client. What is the technical suggestion you would give for this? **[01 *mark*]**

(iv) There is a need to protect this private network by filtering the communication traffic and blocking outsiders from gaining unauthorized access. What mechanism will you suggest to achieve this? **[01 *mark*]**

(v) Include the solutions that you proposed for (iii) and (iv) above in the logical network arrangement that you drew for (ii). **[02 *marks*]**

[*see page ten*

9. (a) A **virtual** supermarket has registered suppliers to supply the customer orders placed online. The supermarket always fulfils its customer orders through these suppliers. One supplier is responsible only for the customers who live in the supplier's area. A customer has only one supplier. Each supplier is characterized by a code (unique), address and contact numbers. A supplier can have several contact numbers.

Each customer is characterized by an email address (unique), name and location.

A customer can confirm orders. Each order has only one supplier and one customer.

An order is characterized by an order number (unique), description and a value. A supplier can supply more than one order.

Note: Use only the terms from the list given below for your ER diagrams of parts (i) and (ii).

List: {address, agent, code, confirms, contactNo, customer, description, email, hires, location, name, order, orderNo, supplier, supplies, value}

(i) Draw the Entity Relationship (ER) diagram for the above description. **[07 *marks*]**

(ii) Sometimes suppliers hire agents to support the order supplies. However, the supermarket identifies the agents only through registered supplier codes. An agent is characterized by a name and a contact number. Each agent is working only for one supplier and a supplier is also getting only one agent's service.

Add these details to the ER diagram you drew for part (i). **[04 *marks*]**

(b) A building construction company signs contracts with its clients. Each contract is handled by an agent of the company.

The **Contracts** table contains the details of the contracts. It has contract number, agent's code, name and mobile phone number represented with **CNo**, **ACode**, **AName** and **AMobile** attributes respectively. The client's name is represented with **Client**. Primary key of the **Contracts** table is **CNo**.

Contracts

CNo	ACode	AName	AMobile	Client
C-112	EP003	Anura	0714545866	Srimal
C-103	EP006	Navod	0774511320	Abish
C-116	EP003	Anura	0714545866	Nehara
C-224	EP015	Virah	0763538147	Srimal

(i) Write an SQL statement to change in the **Contracts** table, the mobile number of the agent whose agent code is EP003 to 0772222222. **[01 *mark*]**

(ii) In which normal form does the **Contracts** table exist? **[01 *mark*]**

(iii) Convert the **Contracts** table into next normal form. (It is **not** necessary to write the data in derived relations in the next normal form.) **[02 *marks*]**

[see page thirteen

7. (a) **PQR Books**, a book shop in your area starts an E-Commerce site to expand its business and to provide services to the customers in other areas. Through it the customers can select their desired books and stationery products and confirm their orders online.

(i) What is the E-Commerce business type applicable in this scenario? **[01 *mark*]**

(ii) What is the revenue model used in this E-Commerce site of PQR Books? **[01 *mark*]**

(iii) With the successful implementation of its E-Commerce site, PQR Books decides to offer digital learning material such as e-books and audio-visual content to its customers. Do you recommend the same revenue model of (ii) above for this as well? Justify your answer. **[01 *mark*]**

(iv) For an increased customer base and popularity, PQR Books plans to provide free access to these digital content through its streaming channel.
Suggest a strategy to increase its business revenue with the help of this proposed streaming channel. **[01 *mark*]**

(v) Write down a key challenge this bookshop has to face when implementing this digital content channel proposed in (iv) above. **[01 *mark*]**

(vi) Name a suitable expansion solution for this E-Commerce site to incorporate both related (e.g., books, stationery etc.) and unrelated (e.g., grocery items, etc.) products or services to enable a more competitive purchasing experience to its customers. **[01 *mark*]**

(b) The following description is about **myShopper**, a multi-agent system which enables a buyer to search the entire online marketplace for the best products. In addition to the price, reviews by other buyers, special offers, reputations of the merchants and the lengths and types of warranties are also considered.

When a **user** (buyer) accesses the **myShopper** website, a **chat-bot** agent starts interacting with the user. User can use voice or text as the input medium to give his/her requirements for a product. During the interaction, the **chat-bot** passes the extracted information to a **search-agent** who will takeover the search for the best product for the user. For this, the **search-agent** will start several **domain-agents** specifying each of them the requirements of the user and specific domains (web sites) to search in. To speedup the search, each **domain-agent** will start several **sub-agents** to search sub-domains under its main domain. After the search, each **sub-agent** will pass the appropriate results back to its parent **domain-agent**. Once all such results from the sub-agents are received, each **domain-agent** compares them and submits the best results to the **search-agent**. The **search-agent** will then compare all such results and gives the details of the best product back to the **chat-bot**. The **chat-bot** will then display it to the **user** as text.

(i) Draw a simplified agent diagram for the above multi-agent system. Name all the entities in your diagram and clearly indicate the interactions between them. **[06 *marks*]**

(ii) Write **one** major advantage of this multi-agent system. **[01 *mark*]**

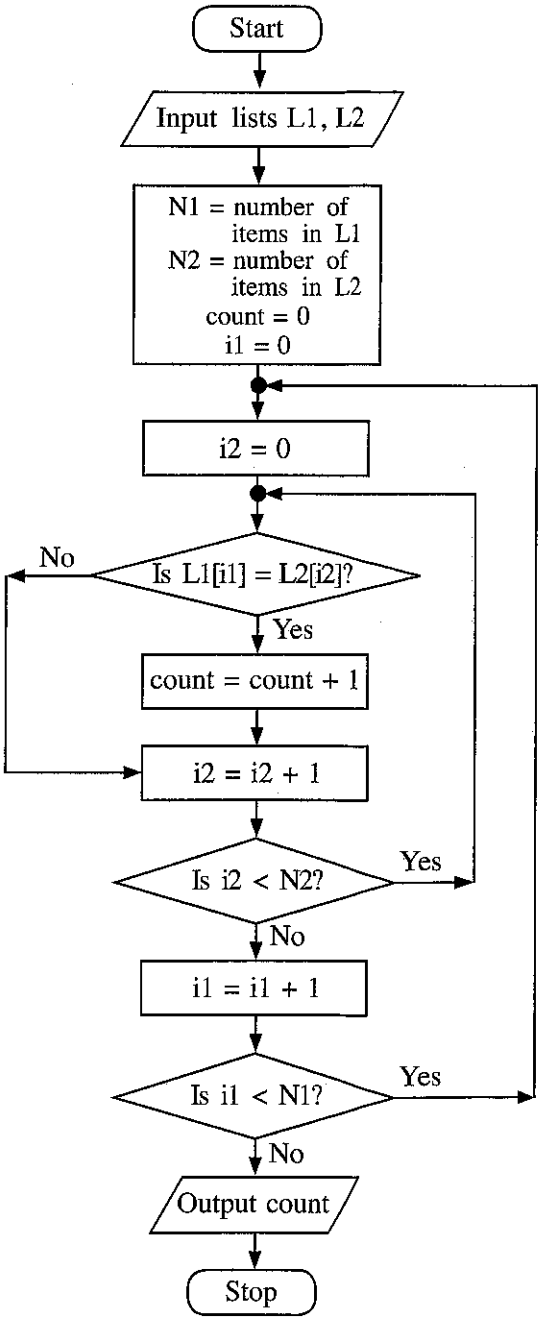
(iii) Write down **one** ICT related challenge which has to be faced when developing a **sub-agent**. **[02 *marks*]**

[*see page eleven*

8. (a) Suppose the ages (in years) of **n** (**n** > 1) students in a school are in a list **L**. Assuming the list **L** and an integer **k** are inputs, express an algorithm using **either** a flowchart **or** pseudo-code to compute and output the average age of students in **L** whose age is less than **k** years.

[05 *marks*]

(b) Consider the algorithm expressed by the flowchart. L1 and L2 are non-empty lists of integers. Each of L1 and L2 has unique elements (no duplicates). But there can be elements that are in both L1 and L2. The notation L[x] denotes the element at Index x of a list L. If there are N elements in list L, then the indices are from 0, 1, 2, ... to (N-1).



(i) What would be the output if L1= 2, 4, 7, 9, 3, 5 and L2 = 1, 3, 8, 9, 6, 5, 7?

[02 *marks*]

(ii) What is the purpose of this algorithm? **[02 *marks*]**

(iii) Develop a Python program to implement the algorithm expressed by the flowchart.

[06 *marks*]

41. What would be the output after executing the following Python code?

```
n = 117
m = (n & 127) // (2 ** 3)
print(m)
```

(1) 1 (2) 14 (3) 14.625 (4) 15 (5) 19

42. What will be the result when the following Python code is executed?

```
x = 10
def myfun(a):
      global x
      a = x + a
      x = 30
      return a
print(myfun(x))
```

(1) 10 (2) 20 (3) 30 (4) 40 (5) an error

43. What will be the output of the following Python code segment?

```
S = ["covid", "pandemic", "vaccine", "booster", "virus"]
V = "aeiou"
count = 0
for i in range(len(S)):
      for j in range(len(S[i])):
            if (S[i][j] in V):
                  count = count + 1
print(count)
```

(1) 0 (2) 5 (3) 12 (4) 13 (5) 32

44. What will be the output when the following Python code is executed?

```
s = 1
for  i  in  range(1,10):

        if (i < 5):
                  s = s * i
        elif (i < 8):
                  s = s - i
        else:
                  s = s + i
                  break
print(s)
```

(1) 6 (2) 14 (3) 23 (4) 33 (5) 121

45. Read the following sentence about *website development*:

To make an effective website, it is important to identify its objectives and the target .....A..... and then design the most useful information layout for the website accordingly.

Which of the following is the correct choice for the blank **A** above?

(1) audio (2) images (3) text (4) users (5) video

46. Which of the following is the correct example for CSS group selector?

(1) h1{text-align:left ; color:blue;}
(2) h1,h2{text-align:left , color:blue;}
(3) h1.h2{text-align:left; color:blue;}
(4) h1:h2{text-align:left; color:blue;}
(5) h1,h2{text-align:left; color:blue;}

[*See page twelve*

47. Consider the following HTML code:

```
<!DOCTYPE  html>
<html>
<head>
<style>
body  {
    background-image:  url('srilanka.jpg');
}
</style>
</head>

<body>
<h2>Sri  Lanka</h2>
<p>Sri  Lanka,  the  island  of  serendipity,  is  really  a  <i>pearl  in  the
orient</i>.</p>
</body>
</html>
```

Which of the following statements is/are correct about the observations when the above code is viewed through a web browser?

A – The srilanka.jpg image (if existing) will be displayed as the background to the web page.
B – The **Sri Lanka** word which is enclosed within <h2> and </h2> tags will appear in italics.
C – The **pearl in the orient** phrase enclosed within and tags will appear in italics.

(1) A only (2) B only (3) C only
(4) A and B only (5) A and C only

48. Which of the following statements is correct about the following code line when it is rendered through a web browser?

```
<input  type="radio"  name="vaccinate"  value="Yes">
```

(1) It shows a radio button with a label named vaccinate at left side.
(2) It shows a radio button with a label named vaccinate at right side.
(3) It shows a radio button with a label named Yes at left side.
(4) It shows a radio button with a label named Yes at right side.
(5) The word Yes is not shown to user.

49. Consider the following PHP code line which is used to create a MySQL database connectivity:

```
$conn  =  new  mysqli($var1,  $var2,  $var3,  $var4);
```

Which of the following is the correct representation for the above variables?

(1) $var1 = database, $var2 = server name, $var3 = user name, $var4 = password
(2) $var1 = database, $var2 = user name, $var3 = password, $var4 = server name
(3) $var1 = server name, $var2 = database, $var3 = user name, $var4 = password
(4) $var1 = server name, $var2 = user name, $var3 = password, $var4 = database
(5) $var1 = user name, $var2 = password, $var3 = server name, $var4 = database

50. What would be the output when the following PHP code is executed?

```
<html>
<body>
<?php
      $class = array ("12-A", "12-B", "13-A");
      echo "IT classes are " . $class[1] . " and " . $class[2] ;
?>
</body>
</html>
```

(1) IT classes are 12-A and 12-B (2) IT classes are "12-A" and "12-B"
(3) IT classes are 12-B and 13-A (4) IT classes are .12-A. and .12-B
(5) IT classes are .12-B. and .13-B

* * *

AL/2021(2022)/20/E-II

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021(2022)
General Certificate of Education (Adv. Level) Examination, 2021(2022)

තොරතුරු හා සන්නිවේදන තාක්ෂණය II தகவல், தொடர்பாடல் தொழினுட்பவியல் II **Information & Communication Technology II**	**20**	**E** **II**

පැය තුනයි மூன்று மணித்தியாலம் ***Three hours***	අමතර කියවීම් කාලය - මිනිත්තු 10 යි மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள் **Additional Reading Time - 10 minutes**

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index No. : .....

Important:

- ✻ *This question paper consists of* **13** *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 - 7)

- ✻ *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 8 - 13)

- ✻ *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 Examiners' Use Only

For the Second Paper		
Part	**Question No.**	**Marks**
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9	
	10	
Total		

Final Marks

In numbers	
In words	

Code Number

Marking Examiner 1	
Marking Examiner 2	
Marks checked by :	
Supervised by :	

[see page two

Part A – Structured Essay

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

Do not write in this column

1. (a) (i) In the following HTML code, underline the parts containing errors. (Please ignore line numbering.)

```
1.   <html>
2.   <body  background-color="green">
3.   <h1>  Welcome  all  of  you  to  online  ICT  Seminar  </h1>
4.   <a  url="#one"  >A/L Student Section</a>
5.   <p> O/L ICT is not available</a>
6.   <-- Section 1 -->
7.   <h4> A/L ICT  </h4>
8.   <hr><p>Good Morning</p></hr>
9.   <br><p> This section is for students </p>
10.  </body></html>
```

[02 *marks*]

(ii) Write the relevant correct code lines to make "A/L Student Section" (in line number 4) a hyperlink to "A/L ICT" (in line number 7).

Code for Line 4 : .....

Code for Line 7 : .....

.....

[01 *mark*]

(b) Consider the styles in Table 1, to answer the given questions.

Table 1

Selector	**Description of the Style**
Class with a class name "**art**"	Size of the font is 14px, Text should be centered
Header 1	Text color is yellow

(i) It is expected to use the above styles in several web pages on a web site. Write a suitable cascading style sheet to define the styles given in Table 1 to satisfy this requirement.

.....

.....

.....

[01 *mark*]

(ii) Write the relevant HTML code lines to include the style sheet defined in part (b)(i) into a web page. [Assume that the style sheet created in part (b)(i) is saved with the name **neat**.]

.....

.....

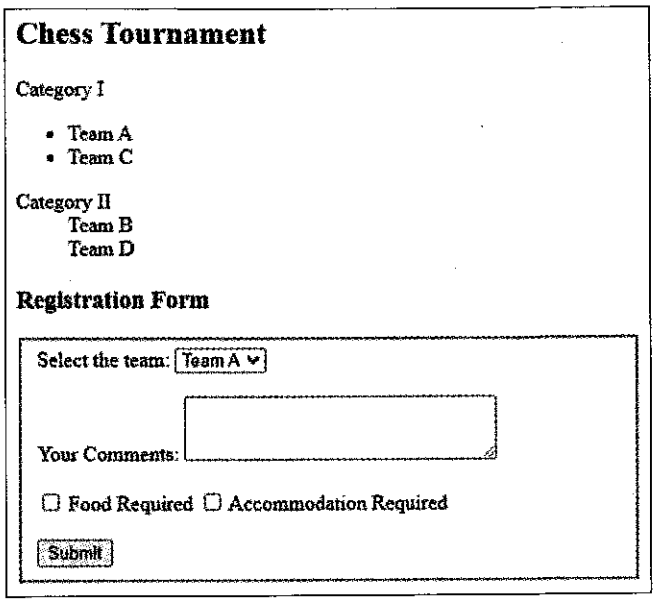
.....

[01 *mark*]

[*see page three*

Do not write in this column

(c) An output of an HTML code rendered by a browser is shown below.



(i) The relevant HTML code (incomplete) is given below. Fill the blanks in it in order to get the required output.

```
<html><body>
<h2>Chess Tournament</h2>
<.....>
    <dt>Category I <.....><li>Team A</li><li>Team C</li></.....></dt>
    <dt>Category II<.....>Team B</.....><.....>Team D</.....></dt>
</.....>
<h3>Registration Form</h3>
<form method="get">
   <.....>
          <label for="Team">Select the team:</label>
            <..... name="team">
               <option value="a">Team A</option>
               <option value="b">Team B</option>
               <option value="c">Team C</option>
               <option value="d">Team D</option>
            </.....><br><br>
         <label for="comment">Your Comments:</label>
        <..... name="comment" rows="3" cols="30"></..... ><br><br>
         <input type=..... name="food">
         <label for="fr">Food Required</label>
         <input type=..... name="accom">
         <label for="ar">Accommodation Required</label><br><br>
         <..... type="submit" value="Submit">
   </.....>
</form>
</body></html>
```

[04 *marks*]

(ii) Write the relevant HTML code line to show "Team B" as the default selection for "Select the team".

.....

.....

[01 *mark*]

[*see page four*

Do not write in this column

2. (a) Cloud Computing allows us to obtain computing resources and capabilities as a service. The three main types of cloud computing services are: *Infrastructure as a Service* (IaaS), *Platform as a Service* (PaaS), and *Software as a Service* (SaaS).

From those three cloud computing service types, write down the suitable service type for each of the following scenarios.

(i) To obtain an environment for application deployment and execution from a cloud service provider – .....

(ii) To obtain hard disk space for data storage from a cloud service provider – .....

(iii) To obtain data file sharing, office applications and email services from a cloud service provider – ..... **[03 *marks*]**

(b) Fill the blanks in the following statements with suitable words from the given list of words.

(i) ..... helps to ensure the confidentiality of our data and information.

(ii) ..... is the attempt to acquire sensitive information by pretending as a trustworthy entity in an electronic communication.

(iii) The illegal copying, distribution, or use of software is known as ..... and ..... helps us to protect our software from such illegal use.

List of words : {Encryption, Copyright, Phishing, Plagiarism, Software piracy} **[02 *marks*]**

(c) The following extract was taken from a software project feasibility report:

"....The software development team does not have the knowledge or prior experience of the relevant technology; the developers must be trained first and as a result of this training cost, the project will not make any profit. However it is expected that the users of the proposed product will use it willingly and no user resistance is expected..."

By considering the above extract, write either **True**, **False**, or **Cannot comment** in the blank for each of the following statements:

The proposed project has *technical feasibility*. {.....}

The proposed project has *operational feasibility*. {.....}

The proposed project has *organizational (institutional) feasibility*.

{.....}

[03 *marks*]

(d) You have decided to start an E-Business to sell your home-made food through an online store (web site). Once the customers place orders and pay through debit/credit cards, you will deliver the ordered food to their addresses.

(i) Business to Business (B2B), Business to Consumer (B2C) and Consumer to Consumer (C2C) are three E-Business transaction types. Out of these, which transaction type will occur in your E-Business?

.....

[01 *mark*]

[*see page five*

(ii) Incorporating a reputed software service to enable debit or credit card purchases from customers will improve customer perception and trust in your e-Commerce system. What is this software service commonly called?

.....

[01 *mark*]

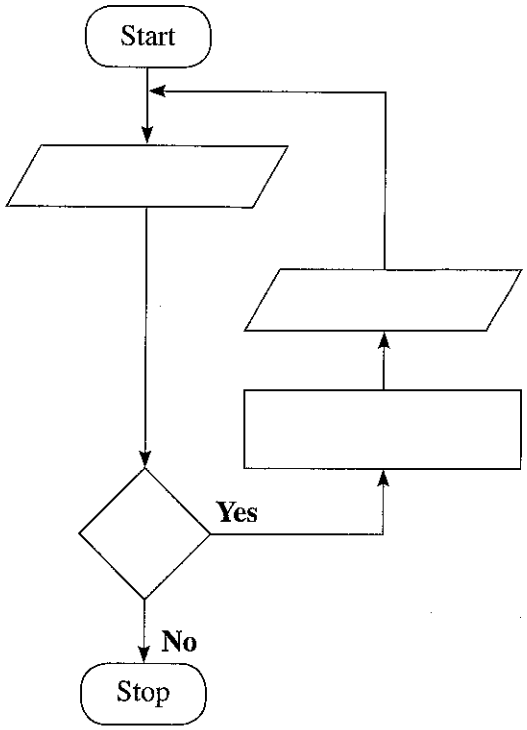
Do not write in this column

3. (a) A flowchart is to be drawn for an algorithm to calculate and output the *areas* of triangles. The *base* and *height* of each triangle are given as inputs.

Note: Area of triangle = $\frac{1}{2}$ × base × height

The algorithm should stop when an input is less than or equal to zero.

Complete the flowchart by writing the required content for the four components left blank.



[04 *marks*]

(b) Complete the four (4) blanks (indicated by .....) in the following Python program to calculate the factorial of an integer.

Note: The factorial of a positive integer is defined as the product of that integer and all the integers below it. e.g., factorial of 4 is equal to 1 × 2 × 3 × 4 = 24. The factorial of 0 is defined as 1.

```
# Get input from user
.....=int(input("Enter a number:"))
factorial = 1
if num < 0:
      print("Factorial is not defined for negative numbers!")

elif ..................................... :
      print("The factorial of 0 is 1")
else:
      for i in range(1,num + 1):

          ..........................................

print("The factorial of",num,"is",.....................................)
```

[04 *marks*]

[*see page six*

(c) Consider the following Python program:

Do not write in this column

```
lower = 2
upper = 5

for num in range(lower, upper + 1):
   flag = 1
   if num > 1:
       for i in range(2, num):
           if (num % i) == 0:
               flag = 0
               break

       if flag == 1:
           print(num)
```

Write the output of the above program.

.....

[02 *marks*]

4. A database application is to be developed for a hospital clinic. The design is as follows.

The registered patients in the clinic are given patient numbers and their details are stored in the PATIENTS data store. The dates and times of clinic appointments of patients are stored in the APPOINTMENTS data store.

Once a patient arrives for a clinic visit and gives the patient number, the reception officer does a **validity check** of the patient and the appointment date by checking the PATIENTS and APPOINTMENT data stores. If valid, the patient number is added to the PRESENT data store. If not, an "unregistered patient" or "invalid appointment" message is given.

When a doctor at a counter in the clinic is ready, s/he selects the next patient according to the PRESENT data store resulting in the relevant patient number and the doctor counter being shown on the display panel in the patient sitting area. When the patient comes and sits at the relevant doctor counter, the doctor retrieves patient's clinical records by accessing the PATIENTS data store. Once the doctor examines patient and prescribes any medicines for him, the PATIENTS data store is updated with the new prescription data and an entry is made to the MEDICINES data store. If needed, the doctor also schedules the next visit date/time for the patient by updating the APPOINTMENTS data store.

The pharmacist gets the prescription data from the MEDICINES data store, prepares the medicines for the patient and makes the patient number displayed on the pharmacy display panel so that the patient can pick the medicines.

(a) If a maximum of 20 patients are to be examined by the clinic doctors per an hour, write down **one** (1) functional requirement with respect to appointment scheduling.

.....

.....

[01 *mark*]

(b) The hospital expects to avoid a long queue of people being formed at the clinic reception for the **validity check**. Write down **one** (1) non-functional requirement with respect to that need.

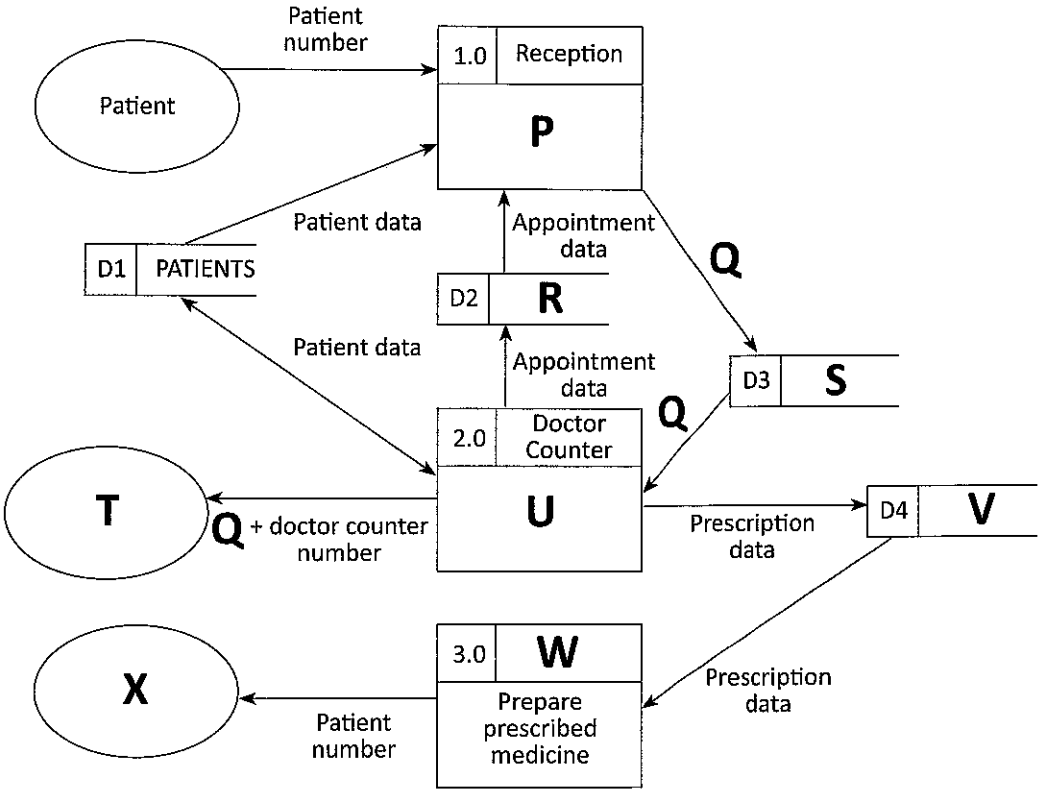
.....

.....

[01 *mark*]

[*see page seven*

(c) The following is the labeled data flow diagram for the events that take place when a patient visits the clinic to consult a doctor.



Write in the spaces provided below, the **Number** of the suitable content for each of the labels **P** to **X** choosing from the given list.

P - ..... **Q** - ..... **R** - ..... **S** - ..... **T** - .....

U - ..... **V** - ..... **W** - ..... **X** - .....

List

Number	Content
1	APPOINTMENTS
2	Examine patient
3	MEDICINES
4	Patient sitting area display panel
5	Pharmacy
6	Pharmacy display panel
7	PRESENT
8	Validate patient number
9	Validated patient number

[07 *marks*]

(d) Give **one** (1) difference between *white box testing* and *black box testing*.

.....

.....

[01 *mark*]

Do not write in this column

* *

[*see page eight*

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2021(2022)
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2021(2022)
General Certificate of Education (Adv. Level) Examination, 2021(2022)

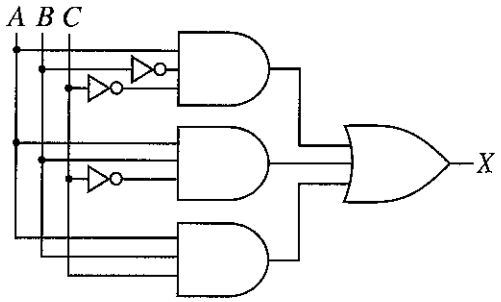
තොරතුරු හා සන්නිවේදන තාක්ෂණය	II
தகவல், தொடர்பாடல் தொழினுட்பவியல்	II
Information & Communication Technology	**II**

20 E II

Part B

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

5. Consider the logic circuit shown in the figure, in which A, B and C are the inputs and X is the output.



(a) Show the complete truth table for the given circuit. **[02 *marks*]**

(b) Complete the Karnaugh map, according to the following format.

C \ AB	00	01	11	10
0				
1				

[04 *marks*]

(c) Using the Karnaugh map, derive an optimal (most simplified) sum-of-products (SOP) expression for the output X. Show the loops clearly on the Karnaugh map. **[03 *marks*]**

(d) Using the Karnaugh map, derive an optimal (most simplified) product-of-sums (POS) expression for the output X. Show the loops clearly on the Karnaugh map. **[03 *marks*]**

(e) Of the optimal SOP and POS expressions you obtained in (c) and (d) above, which is better (or more suitable) to implement a simplified logic circuit? Explain your answer. **[03 *marks*]**

[*see page nine*

10. (a) (i) Explain **one (1)** way in which the *bar code technology* can be beneficial to a library management system. **[02 *marks*]**

(ii) Most modern computers have multiple processors in them. Explain **one (1)** way in which the multiple processors in such computers can be beneficial. **[02 *marks*]**

(iii) Explain what is meant by *volatile memory* **and** write down **one (1)** example for such selecting from the list below.

List: {Dynamic RAM (DRAM), Hard disk, L1 cache, Registers} **[02 *marks*]**

(b) (i) A student asks you how all applications started by him execute simultaneously although he has a **single-processor computer**. Write down your explanation. **[03 *marks*]**

(ii) Programs whose sizes are even larger than the size of the available physical memory of a computer could be executed on it. How can that be possible? **[04 *marks*]**

(iii) When *linked allocation* is used for disk space allocation, each file needs slightly more storage space than when *contiguous allocation* is used. Explain the reason for it. **[02 *marks*]**

* * *