

2021(2022)

**MCQ,
STRUCTURE
&
ESSAY
MARKING
(English Medium)**

Advanced Level - ICT

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G.C.E. (A/L) Examination 2021(2022)

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Information and Communication
Technology

Scoring procedure PART I

Question number	Answer number	Question number	Answer number	Question number	Answer number	Question number	Answer number	Question number	Answer number
01.	3	11.	4	21.	2	31.	5	41.	2
02.	4	12.	4	22.	1	32.	5	42.	2
03.	4	13.	5	23.	5	33.	4	43.	4
04.	5	14.	1	24.	2	34.	3	44.	2
05.	4	15.	4	25.	2	35.	4	45.	4
06.	4	16.	3	26.	3	36.	3	46.	5
07.	4	17.	5	27.	4	37.	5	47.	5
08.	3	18.	5	28.	3	38.	5	48.	5
09.	2	19.	3	29.	1	39.	1	49.	4
10.	2	20.	5	30.	5	40.	2	50.	3

Paper II mark scheme

Notes

1. Essential keywords sufficient for credit in some answers are underlined.
2. Acceptable alternatives for a given word or set of words are separated by slashes.
3. ←-- A indicates that any credit for the item should be given only if A is correct.
4. Answers where minor spelling mistakes are acceptable are indicated. A minor spelling mistake is where at most one character is either missing, wrong or in excess.
5. Rounding off of 0.5 marks should only be done to the final total for Paper II.

1. (a) (i) Underline parts containing errors.

[2]

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
5. <p> O/L ICT is not available
6. - - Section 1- ->
7. <h4> A/LICT </h4>
8. <hr> <p> Good Moming </p> </hr>
9.
 <p> This section is for students </p>
10. </body> </html>

The above total mark is decided as follows:

2 marks for 4 or 5 places distinctly underlined

1 mark for maximum 1, 2 or 3 places distinctly underlined

Note :

- ▼ Deduct 1 mark for one or more incorrect underlines.
- ▼ If everything is underlined, then 0 marks.

(ii) Write relevant code lines to make A/L Student Section (line 1) a hyperlink to A/L ICT (line 7).

[1]

0.5 marks for each:

Line 4: `< a href = "#one" > A/L Student Section </a>`

Line 7: `<h4 id = "one"> A/L ICT </h4>`

Or

Line 7: `<a id = "one"> <h4> A/L ICT </h4> </a>`

Or

Line 7: `<a name = "one"> <h4> A/L ICT </h4> </a>`

NOTE: **HTML 5 does not support it.**

h4 tag can be written as the outer tag as well. i.e.,

Line 7: `<h4> <a id = "one"> A/L ICT </a> </h4>`

Notes :

- ★ Instead of "one", any other id (without spaces) can also be used on lines 4 and 7.
- ★ Quotes on lines 4 and 7 are essential.
- ★ Ignore space and case defects.

(b) (i) Write a suitable cascading style sheet.

[1]

0.5 marks for each line:

`.art {font-size: 14px; text-align: center;}`

`h1 {color: yellow;}`

Notes :

- ▼ "art" must be in lower case as in question.
- ▼ If written within the `<body> </body>` or `<head> </head>`, then do NOT give marks.

(ii) Write relevant HTML code lines to include style sheet to a web page.

[1]

```
<head>
<link rel = "stylesheet" type = "text / css" href = "neat.css">
</head>
```

Notes :

- ★ "text/css" is optional.
- ▼ "stylesheet" has to be a single word.

(c) (i) Fill the blanks in the code.

[4]

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

0.5 marks allocated to each of the following:

A: 2 dl tags

B: 2 ul tags

C: 4 dd tags

D: 2 fieldset tags (▼ "fieldset" has to be a word.)

E: 2 select tags

F: 2 textarea tags (▼ "textarea" has to be a word.)

G: 2 checkbox tags (▼ "checkbox" has to be a word.)

H: 1 input tag

Notes :

▼ Ignore case.

(ii) Write the relevant HTML code line to show "Team B" as the default selection. [1]

`<option value="b" selected >Team B</option>`

Notes :

▼ Ignore case in all except for "b".

2. (a) Write down the suitable cloud computing service type.

[3]

1 mark for each:

- (i) Platform as a Service / PaaS
- (ii) Infrastructure as a Service / IaaS
- (iii) Software as a Service / SaaS

Notes :

▼ Ignore case.

(b) Fill the blanks in the statements.

[2]

0.5 marks for each.

- (i) Encryption
- (ii) Phishing
- (iii) Software piracy
- Copyright

Notes :

▼ Ignore case

(c) Write True, False or Cannot comment.

[3]

1 mark for each:

- (technical feasibility) / False
- (operational feasibility) / True
- (organizational/institutional feasibility)

Notes :

▼ Ignore case

(d) (i) E-Business selling foods: B2B, B2C or C2C?

[1]

B2C / Business to Consumer / Business to Customer

Notes :

- ▼ Upper case needed for the abbreviated answer (i.e., B2C)
- ▼ Ignore case for the other answer (i.e., Business to Consumer)

(ii) What is the electronic payment service commonly called?

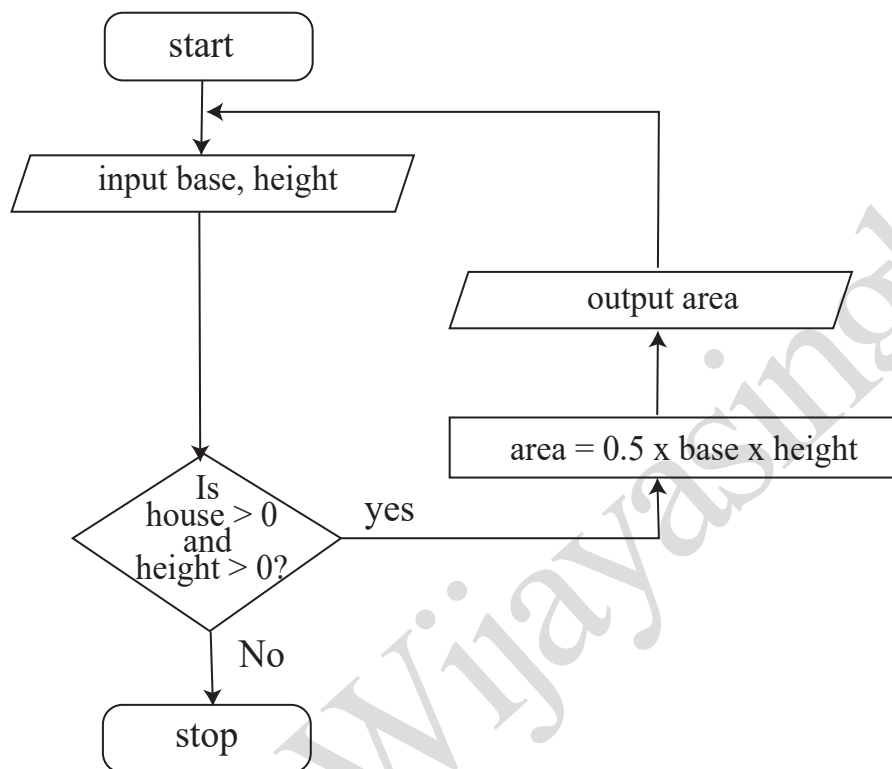
[1]

payment gateway

3. (a) Fill the four components in the flowchart.

[4]

1 mark for each correct component.



Notes :

- ★ For "input": any other word that conveys the meaning is acceptable, e.g., get, read
- ★ For "output": any other word that conveys the meaning is acceptable. e.g., display, print, show
- ★ For condition: "is base and height > 0?" is also acceptable and "is", "?" essential.
- ★ For variable names: b/B.h/H acceptable. Other meaningful names are also acceptable. If any other single letter is used for a variable, then it has to be defined.
- ▼ For credit for the output component to be given, it has to indicate displaying what-ever was computed in the computation block.

(b) Fill the four blanks in the factorial code.

[4]

1 mark for each:

```
num
num == 0
factorial = factorial * 1 (correct indentation essential.)
factorial
```

Notes :

★ "factorial i" is also acceptable for the third blank.

▼ Correct case essential

(c) Write the output of the python program.

[2]

```
| 2
| 3
| 5
```

The above total mark is decided as follows:

2 marks for the exact answer (with or without vertical alignment.)

1 mark for either 2 3 or 2,3,5 or 2,3

Notes :

▼ Correct order important.

4. (a) Write down one functional requirement w.r.t. appointment scheduling. [1]

Any answer having the following meaning:

For any given hour, no more than 20 patients should be sheduled.

(b) Give one non-functional requirement w.r.t. the validity check [1]

Any answer having the following meaning:

The validity check should be done fast.

(c) Write the suitable content numbers. [7]

P - 8 Q - 9 R - 1 S - 7 T - 4
U - 2 V - 3 W - 5 X - 6

The above total mark is decided as follows:

7 marks for all 9 labels correct

6 marks for maximum 8 labels correct

5 marks for maximum 7 labels correct

4 marks for maximum 5 or 6 labels correct

3 marks for maximum 4 labels correct

2 marks for maximum 3 labels correct

1 mark for maximum 1 or 2 labels correct

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

Any one from the following:

White box	Black box
code remains visible to testers	code remains hidden to testers
a low-level testing that involves detailed testing of code	high-level testing that does not involve detailed program level testing
Genarally done by developers	Genarally done by independent testers/users
Design documents are usually used to testing	Specification document is required to testing
Tests the logic and implementation of software	Tests functionality of software
Programming knowledge and implementation details are required	Prior knowledge of programming is not required
Types of tests include path testing, control structure testing, loop testing, conditions testing	Types of tests: boundary value analysis, comparison tests etc
Generally tesing tools depend on programming language	Generally tesing tools are independent of programming language

5. (a) Show the complete truth table for the given circuit.

[2]

P	Q	R	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

The above total mark is decided as follows:

2 marks for all 8 rows correct

1.5 marks for maximum 5,6,7 rows correct

1 mark for maximum 3,4 rows correct

0.5 marks for maximum 1,2 rows correct

Note :

- ★ Having Output as the X column title is acceptable.
- ▼ If the X column is not labelled, or the label is different from X / Output, reduce 1 mark from the earned total.

(b) Complete the Karnaugh map according to the given format.

[2]

0.5 marks for each correct cell:

		AB			
		00	01	11	10
C	0	0	0	1	1
	1	0	0	1	0

(c) Using the Karnaugh map, derive a simplified SOP expression for X.

[3]

		AB			
		00	01	11	10
C	0	0	0	1	1
	1	0	0	1	0

$$X = AB + A\bar{C}$$

Marks allocated as follows:

A: 2 marks for marking the two loops on the correct Karnaugh map (1 mark for each)

B: 1 mark for correct, simplified final SOP expression as $X = AB + A\bar{C}$ (← A)

Note :

▼ For component B, the term X is not compulsory.

(d) Using the Karnaugh map, derive a simplified POS expression for X.

[3]

		AB			
		00	01	11	10
C	0	0	0	1	1
	1	0	0	1	0

$$X = A(B + \bar{C})$$

Marks allocated as follows:

A: 2 marks for marking the two loops on the correct Karnaugh map (1 mark for each)

B: 1 mark for correct, simplified final POS expression as $X = A(B + \bar{C})$ (← A)

▼ For component B, the term X is not compulsory.

(e) Out of the two expressions which one is better to implement a more simplified logic circuit than the given logic circuit? Explain.

[3]

The POS, $X = A(B + \bar{C})$, is better than the SOP, $X = \bar{A}B + AC$.

Explanation:

With POS, we can implement a simpler logic circuit with one OR gate, one AND gate and one NOT gate (only three gates) whereas the SOP leads to a logic circuit with two AND gates, one OR gate and one NOT gate (four gates).

Marks allocated as follows:

A: 1 mark for correctly identifying that the POS is better than the SOP
(<- - correct SOP and POS expressions for 5(c) and 5(d))

B: 2 marks for correct explanation on why the POS is better than the SOP given as follows:
(<- - A)

1 mark: POS has fewer (3) literals and leads to a logic circuit with 3 gates

1 mark: SOP has more (4) literals and leads to a logic circuit with 4 gates

or alternatively;

B: 2 marks for correctly showing the two correct circuit diagrams and identifying the better one or for indicating generally that POS results in a circuit that has fewer gates when compared to the circuit resulting from SOP (<- - A)

IMPORTANT: Note the dependency in marking component A. This basically means not to give credit for part (d) if the student is not basing his/her argument using the expressions $X = AB + A\bar{C}$ and $X = A(B + \bar{C})$.

6. (a) Explain how the odd parity check could be used to detect any error in the transmission [2]

Marks allocated as follows:

As I mark for adding 1 as the parity bit

B: 1 mark for receiver has to get the total number of bits odd ; if not error

Notes :

- ★ Ignore the position where the parity bit is added.

(b) Fill the empty entries in the IP address table. [6]

0.5 marks for each correct cell.

Division/ Unit	Network ID	Broadcast ID	Subnet Mask	No. of Nodes	Usable IP Address Range
Marketing	192.174.19.0	192.174.19.63	192.174.19.192	64	192.174.19.1 - 192.174.19.62
Stores	192.174.19.64	192.174.19.79	192.174.19.240	16	192.174.19.65 - 192.174.19.78
Supplies	192.174.19.96	192.174.19.111	192.174.19.240	16	192.174.19.97 - 192.174.19.110
Operations		192.174.19.159		32	

Important : Any or no answer to the three cells on the last row (operations) is considered acceptable.

(c) (i) Which network topology will you suggest for Mohan ? [1]

ring

or alternatively

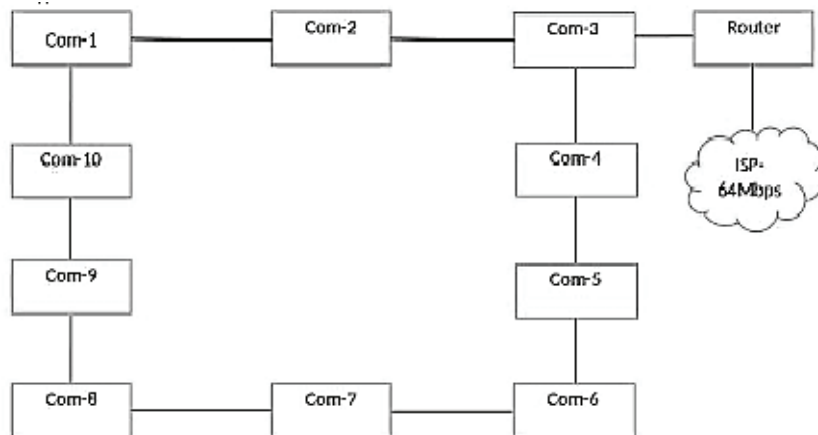
mesh

NOTE : mesh is acceptable as an answer. But may not be very beneficial due to extra interconnections needed. performance degradation and inadequate user requirement to go for a mesh.

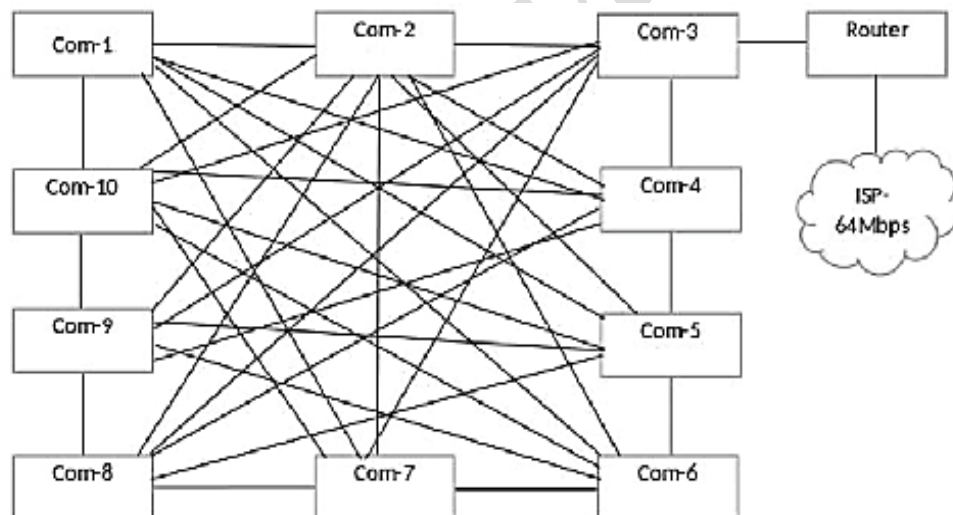
(ii) Draw the logical arrangement of the network.

[2]

Ring:



[if the student has chosen a mesh:]



1 mark for each :

A: 10 computers properly connected to Router/

10 computers properly connected to Router along with a firewall and/or proxy
(<--- topology chosen is either ring or mesh)

B: Router connected to Internet connection

Note :

▼ The following symbols are also accepted for this part and for part (v):

Router		Firewall
		

▼ Instead of "ISP", "Internet" is also acceptable.

[1]

[1]

[2]

The diagram illustrates a network topology. At the top, a horizontal chain of four boxes is connected by lines: Com-1, Com-2, Proxy, and Firewall. Below Com-1 is a vertical stack of three boxes: Com-10, Com-9, and Com-8. Below Com-2 is a vertical stack of three boxes: Com-4, Com-5, and Com-6. Below the Proxy box is a vertical stack of two boxes: Com-4 and Com-5. Below the Firewall box is a vertical stack of two boxes: Router and ISP-64Mbps (represented by a cloud icon). The Router is connected to the ISP cloud. The ISP cloud is connected to the Router. The Router is connected to the Firewall. The Firewall is connected to the Proxy. The Proxy is connected to Com-2. Com-2 is connected to Com-1. Com-1 is connected to Com-10. Com-10 is connected to Com-9. Com-9 is connected to Com-8. Com-8 is connected to Com-7. Com-7 is connected to Com-6. Com-6 is connected to Com-5. Com-5 is connected to Com-4. Com-4 is connected to the Proxy. The Proxy is connected to the Firewall. The Firewall is connected to the Router. The Router is connected to the ISP cloud. The ISP cloud is labeled 'ISP-64Mbps'.

B : Properly adding and labelling firewall

7. (a) (i) What is the ecommerce business type applicable in this scenario ? [1]

B2C/ Business to Consumer / Business to Customer

(ii) What is the revenue model used in this E-Commerce site? [1]

online sales

(iii) Do you recommend the same revenue model of (ii) for offering digital learning material ? Justify. [1]

If Yes, then justification should relate the possibility of online sales as a revenue model for digital content.

If No, then justification should relate the challenges with online sales for the digital content (in that case, use subscription as a revenue model.)

(iv) Suggest a strategy to increase the business revenue with the help of the proposed streaming channel. [1]

Advertisements as a revenue model or a suitable answer

(v) Write down a key challenge the bookshop has to face when implementing the digital content channel. [1]

Answer could be in the following themes with an explanation why it is important:

- Cost-effectiveness: giving free access to this service
- Content quality: Recording/preparation and editing must meet standards; reducing bandwidth consumption of the viewers
- Copyright issues: Should avoid improper use of IP/Copyright material within content and through the channel offering
- Technical suitability: Should provide uninterrupted service (availability); compatibility with many devices/browsers (compatibility), service efficiency, security, etc.-

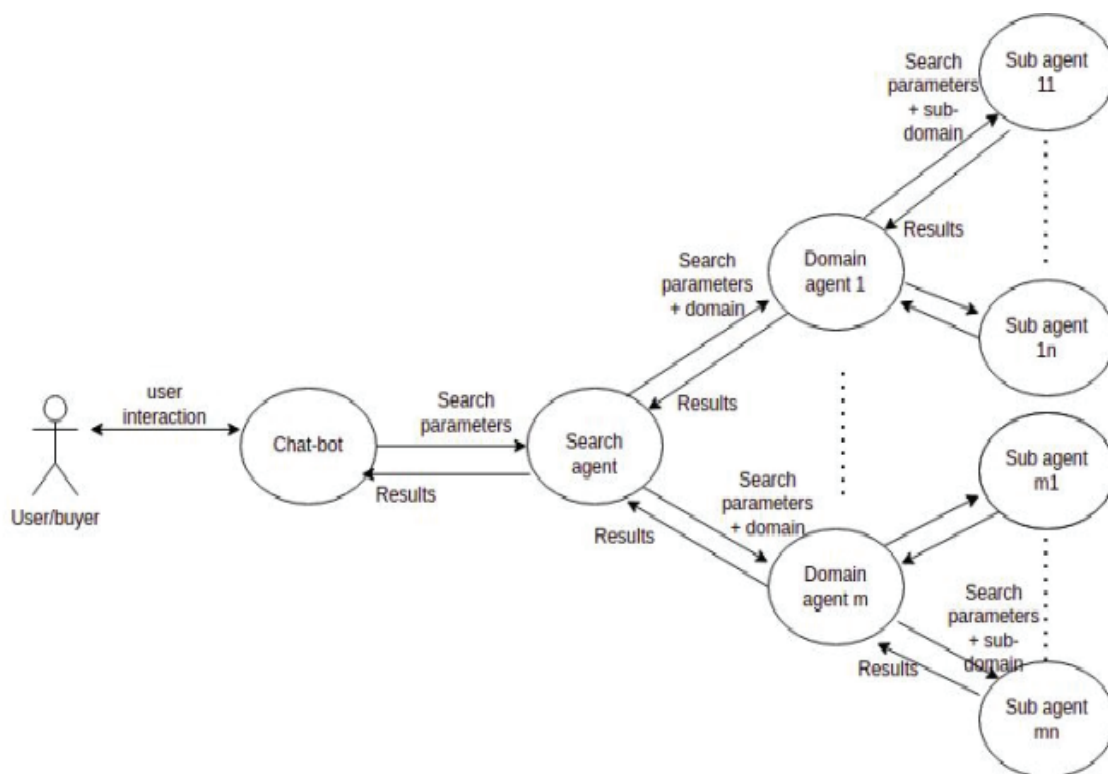
(vi) Name a suitable expansion solution to incorporate both related and unrelated products or services.

[1]

an E-commerce market place / E-marketplace / On-line marketplace

(b) (i) Draw a simplified agent diagram and name important entities and interactions.

[6]



Marks allocated as follows:

A: 1 mark for User to ChatBot Agent interaction (two-way arrow) Confidential

B: 1 mark for ChatBot Agent to Search agent interaction (two-way arrow)

C: 1 mark for Search Agent to Domain Agent interactions (two-way arrows)

D: 1 mark for Domain Agent to Sub-agent interaction (two-way arrows)

E: 1 mark for indicating multiple domain agents and multiple sub-agents

F: 1 mark for describing all interactions correctly

Note :

- ★ If a student has included a user interface, ignore that additional information and mark as given in the scheme.
- ★ Describing all interactions along only one complete path from beginning to end is sufficient for F component above.

(ii) Write one major advantage of this multi-agent system.

[1]

Any one of the following :

- Convenience to buyer: Buyer need not do the evaluation him/herself
- Increased speed of getting the result
- Buyer does not have to type lengthy description of his requirement as a Chat-bot helps
- Cost effectiveness for buyer as s/he need not physically visit multiple shops

(iii) Write one ICT related challenge when developing a sub-agent.

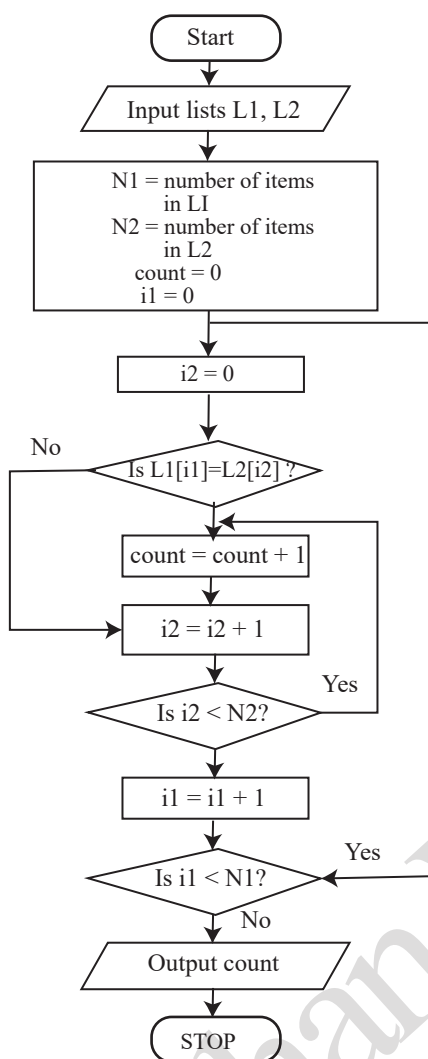
[2]

Any one of the following :

- Information on different websites may be in different formats.
- Language processing may be required to extract information from sites.
- Information on different websites may be in different Lanugages.
- Sub-agents should not take a long time to give the results.
- Two sub-agents should not search the same site through indirect access.

8. (a) Construct a flow-chart or pseudo-code to output the average age of students in L whose age is < k years.

[5]



Using for-loop

```

input L, k
n = length of L
count = 0
for i = 0 to n
    if (L[i] < k)
        count = count + 1
        sum = sum + L[i]
    end-if
end-for
average = sum / count
output average
  
```

Alternative using while-loop

```

input L, k
n = length of L
sum = 0
count = 0
i = 0
while (i < n)
    if (L[i] < k)
        count = count + 1
        sum = sum + L[i]
    end-if
end-while
average = sum / count
output average
  
```

Marks allocated for either Rowchart or pseudo-code as follows:

- A: 1 mark for getting inputs correctly
- B: 1 mark for correct a looping
- C: 1 mark for correct computation (<- - B)
- D: 1 mark for correct output action (<- - C)
- E: 1 mark for completeness (<- - D)

FLOWCHART: important and correct symbols for start, stop, input/output, processes, conditions

PSEUDO-CODE: Begin-End, indentation

Note :

- ★ Acceptable synonyms: (Start, Begin), (Stop, End, Finish), (Input, Get, Read), (Output, Print, Show, Display) [ignore case]
- ★ In could also be a user input.
- ★ Loop index can go from 1 to n as well.

(b) (i) What would be the output if L1 2,4,7,9,3,5 and L2 1,3,8,9,6,5,77

[2]

4/ Output = 4 / or anything similar to indicate the output is 4

(ii) What is the purpose of this algorithm?

[2]

Output the number (count) of a elements that are in both lists L1 and L2.

Allocate marks as follows:

1 mark for the number (count) of elements that are in both Lists L1 and L2

1 mark for displaying the result.

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

[6]

```
# Inputs : L1, L2 are non-empty lists of integers
#      Each of L1, L2 have unique elements (no duplicates)
# Output : number (count) of elements that are in both L1 and L2
#
inL1 = input("Enter the elements in L1: ")
L1 = [int(x) for x in inL1.split()]
inL2 = input("Enter the elements in L2: ")
L2 = [int(x) for x in inL2.split()]
count = 0
for i1 in L1:
    for i2 in L2:
        if i1 == i2:
            count = count + 1
print(count)
```

Allocate marks as follows:

A: 1 mark for getting inputs correctly

B: 1 mark for correct outer loop

C: 1 mark for correct inner loop (<-- B)

D: 1 mark for correct if construct (<-- C)

E: 1 mark for correct output printing (<-- D)

F: 1 mark for correct indentation (<-- E)

[7]



NOTE: 1 mark for each entity

NOTE: 1 mark for each relationship

C: 1 mark for ContactNo (multi-valued attribute)

★ Ignore case of letters.

▼ Deduct a maximum 1 mark from the total earned mark if any other additional parts are drawn.

▼ If there is any spelling mistake (one or two letters) deduct one mark the earned total. Naming entities in plural forms (e.g., suppliers) is also considered as spelling mistakes.

(ii) Add the agent to the ER diagram.

[4]

Marks allocated as follows:

A: 1 mark for agent being a weak entity

B: 1 mark for attributes of agent

C: 1 mark for weak relationship (total participation not necessary)

D: 1 mark for correct cardinality

(b) (i) Write an SQL statement to change the mobile number of EP003 agent to 0772222222.

[1]

UPDATE Contracts SET AMobile = '0772222222' WHERE
ACode = 'EP003';

Note :

- ▼ Exact case is required for those that are underlined. Ignore case for the rest.
- ★ Ignore quotes in 0772222222
- ★ Ignore semicolon.

(ii) In which normal form does the Contracts table exist?

[1]

2NF / second normal form

(iii) Convert the Contracts table to the next normal form. (It is not required to write the data in the derived relations,)

[2]

1 mark for each.

A: Contracts (CNo , ACode, Client)

B: Agent (ACode, AName, AMobile)

Note :

- ▼ Ignore case.
- ★ Other meaningful names for "Contracts" and "Agent" relations also acceptable.
- ★ The primary keys should be marked as shown

10. (a) (i) Explain one way in which bar code technology can be beneficial to a library management system.

[2]

Marks allocated as follows:

A: 1 mark for fixing a bar code to each book

B: 1 mark for explaining the benefit

(ii) Explain one way in which multiple processors in computers can be beneficial.

[2]

Any one from the following:

- When there are multiple processes that the user has started on the computers, they can run on the different processors simultaneously to finish everything quicker.
- Can be used for parallel computing; complicated tasks can be split to parts and the parts can be programmed to run on the different processors to finish everything quicker.

The above total mark is to be decided as follows:

Give the full 2 marks if the answer is complete. Else, give 1 mark.

(iii) Explain what is meant by volatile memory and select an example from the list.

[2]

Marks allocated as follows:

A: 1 mark for explaining volatile memory : computer storage that only maintains its data while the device is powered

B: 1 mark for any one from (Dynamic RAM (DRAM), L1 cache, Registers)

(b) (i) How all applications "execute simultaneously" on a single processor computer?

[3]

Marks allocated as follows:

A: 2 marks - explaining the concept of multiprogramming / time sharing

B: 1 mark - switching between processes happen fast

(ii) How can the programs whose sizes are larger than physical memory could be run on a computer ?

[4]

The marks allocated as follows:

A: 1 mark for Entire program is not brought to physical memory at once

B: 1 mark for for program stored in virtual memory / hard disk

C: 1 mark for program divided into “pages”

D: 1 mark for pages are brought into physical memory when needed (<-- C)

(iii) Why each file needs slightly more space in linked allocation ?

[2]

The marks allocated as follows:

A: 1 mark for each block contains a pointer to the next block.

B: 1 mark for That block takes some space.(<--A)