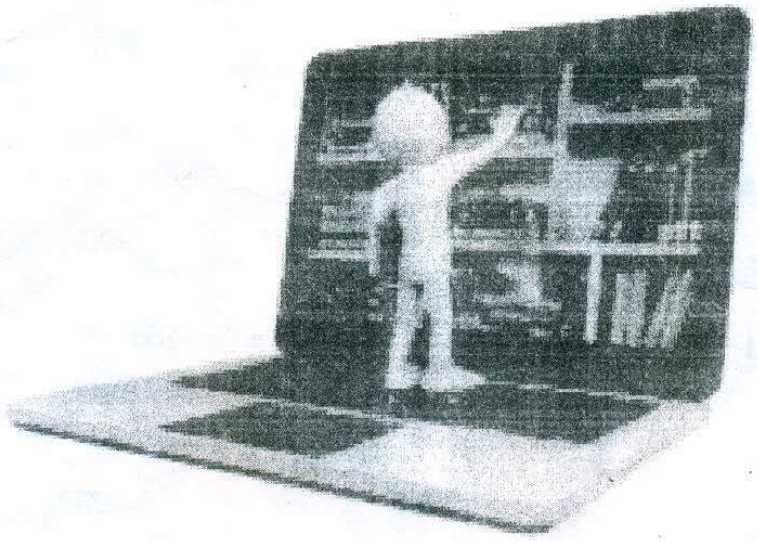
Confidential

Department of Examinations - Sri Lanka

G.C.E. (A/L) Examination - 2015

20 - Information & Communication Technology

Marking Scheme



This has been prepared for the use of marking examiners. Some changes would be made according to the views presented at the Chief Examiners' meeting.

mendments to be included

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G.C.E. (A/L) Examination - 2015

20 - Information & Communication Technology

Distribution of Marks

Paper I	:	2 x 50	=	100
Paper II	:			
Part A	:	4 x 10	=	40
Part B	:	4 x 15	=	60
			=	100
Total			=	200
Final Marks		200 ÷ 2	=	100

If both 1 & 4 - 1 mark

Part I

Q. No	Answer	Q. No	Answer	Q. No	Answer	Q. No	Answer	Q. No	Answer
1	4	11	2 or 3	21	5	31	5	41	4
2	5	12	3	22	1	32	1	42	2
3	3	13	1,4 & or	23	5, 5	33	5	43	3
4	4	14	5	24	1	34	2	44	1
5	3	15	5	25	1	35	1	45	5
6	4	16	1	26	3	36	3	46	4
7	1	17	3	27	2	37	3	47	2
8	3	18	3/4	28	5	38	2	48	3
9	5	19	5	29	1	39	1	49	5
10	1	20	2	30	5	40	2	50	3

11 – 2 or 3

13) 255.255.255.128 – Subnet mask

PART A – Structured Essay

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

1. (a) Consider the web form given in the figure which has been developed for sending text messages from a web application.

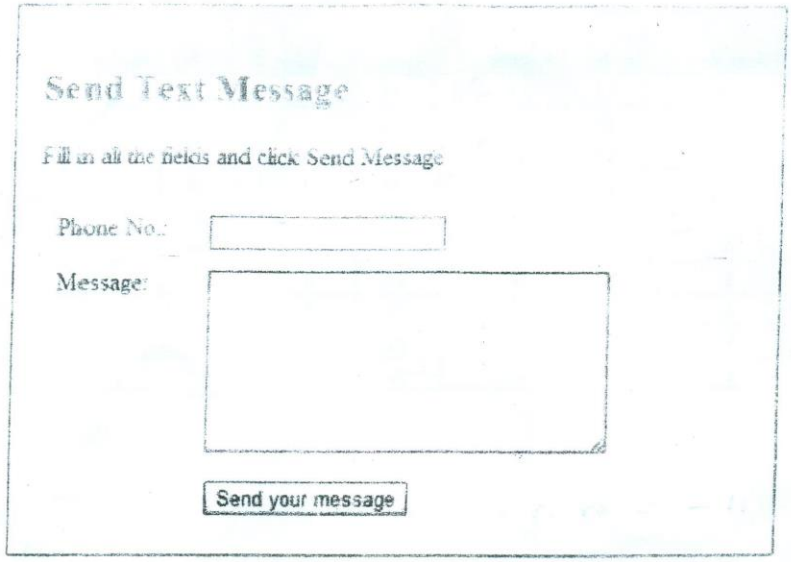


Figure: Form used to send text messages

The partial HTML code segment given below is prepared to generate the above form. Complete the code segment to render the above form.

```
<h2>Send Text Message</h2>
<p>Fill in all the fields and click Send Message</p>
<form action="" method="POST">
   <div class = "a">
      <div class = "l"> Phone No.:</div>
      <div class = "r"><input type=..... name="phone" size="20"></div>
   </div>
   <div class = "a">
      <div class = "l">Message:</div>
      <div class = "r"><..... .....name="message" rows="7" cols="30">
         </ ..... ></div>
   </div>
   <div class = "a">
      <div class = "r"><input type="submit" value= "Send your message" ></div>
   </div>
</form>
```

Answer
4
3
1
5
4
2
3
5
3

2.

(b) A well formed syntactically correct HTML code has been developed to render a web page which includes an image of a school. However, the browser does not display the image. Instead, it only displays the text "School" which is given as the 'text' attribute of alt. Give two possible reasons for this behaviour.

(i) .....

(ii) .....

(c) Indicate whether the following CSS rules are syntactically correct or incorrect. If a rule is incorrect write the correct version.

(i) p {color: red;}

p{font-type: Arial;} .....

.....

(ii) body{color: red;} .....

{background-color: yellow;} .....

.....

(iii) h1, h3{color: blue;} .....

.....

.....

2. (a) Assume that in a particular digital device integers are represented in 8-bits two's complement form. However, the results of computations are printed in decimal.

(i) Give the representation of 10_{10} in the above device.

(ii) Give the representation of -25_{10} in the above device.

(iii) Explain how the computation of $10_{10} - 25_{10}$ done by the device by using your representations given in sections (i) and (ii) above.

(iv) List the steps necessary to transform the result obtained in section (iii) above into decimal form in order to print the answer.

(b) A bank offers services, such as maintaining savings and current accounts, Automatic Teller Machine (ATM) services, processing loans, leasing properties and exchanging foreign currencies to its customers. The bank has decided to introduce Internet banking facility to its customers to grant them with more control on their accounts. This will facilitate its customers to check account balance, pay bills, transfer funds to other accounts and communicate with the bank online.

(i) State two reasons that can discourage bank customers from using Internet banking services.

(ii) Do you agree that providing the proposed Internet banking services is a B2C business type? Justify your answer.

(iii) The bank has realized that a significant number of loan applications they receive from their customers are getting rejected at the initial screening. Therefore, the management thinks that their customers could be provided with an expert system based loan pre-processing tool so that the customer disappointments could be reduced while saving bank staff's time. Do you agree with this idea? Justify your answer.

3. (a) Albert Einstein quoted "Energy cannot be created or destroyed; it can only be changed from one form to another."

(i) State whether the process of changing energy from one form to another is a closed system.

(ii) State a reason to justify your answer given for (a) (i), above.

4.

(b) Consider the following Data Definition Language (DDL) statement to answer the questions b (i) and b (ii).

```
CREATE TABLE unit (
    instituteCode varchar(10) NOT NULL,
    unitCode varchar(10) NOT NULL,
    unitTitle varchar(50) DEFAULT NULL,
    PRIMARY KEY (instituteCode,unitCode),
    FOREIGN KEY (instituteCode) REFERENCES institute(instituteCode))
```

(i) What is the primary key of the above table?

(ii) What are the integrity constraints used in the above DDL?

(c) Consider the following table:

index	name	address	class
1022	S.M.G.D. Dayasiri	No. 15, Peradeniya Road, Kandy	8 B
566	G.M.D. Priyangani	No. 147/7, Katugasthota Road, Kandy	11 C
923	F.D.C. Jayasingha	"Sadasiri", Colombo Road, Mawanella	10 B

(i) What is the cardinality of the above table?

(ii) What is the degree of the above table?

4. (a) A 32-bit computer has a byte addressable main memory. The computer uses 32-bit addresses to access any byte in its memory. It is observed that a maximum of 4 GB memory is available for a process even after the main memory is replaced by an 8 GB memory. Explain, with all the calculations, why this happens.

(b) An operating system uses seven state process transition model for process scheduling. A given process is currently in the running state of the above model. Fill the following table with the correct next possible state and condition for transitions.

Current state	Next possible state	Condition for transition
Running		

සියලු ම හිමිකම් ඇවිරිණි / முழுப் பதிப்புரிமையுடையது / All Rights Reserved]

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka
ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2015 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2015 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2015

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

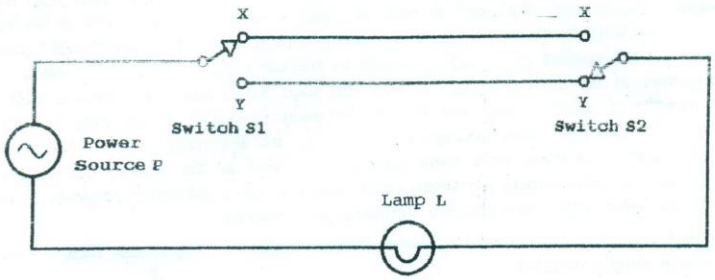
20 E II

Part B

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

1. (a) Explain how to derive a Boolean expression from a given truth table.

(b) In residential electrical wiring, the following circuit has been used to operate a light in a staircase.



As in the above circuit, two switches S1 and S2 are installed at the bottom and the top of the staircase to operate the lamp L. The lamp turned on by using the switch S1 at the bottom of the staircase can be turned off by using the switch S2 at the top of the staircase. Further, the lamp turned on by using switch S2 at the top of the staircase can also be turned off by using the switch S1 at the bottom of the staircase. Moreover, the lamp L turned on by a switch can be turned off by the same switch.

Assume that the connections to positions X and Y of a switch in the above circuit are represented by the truth values 1 and 0 respectively and the turned on and turned off states of the lamp L are represented by the truth values 1 and 0 respectively.

(i) Construct a truth table to represent the functionality of the above circuit.

(ii) Derive a Boolean expression to represent the truth table obtained in section (i) above.

(iii) What is the logic gate which is equivalent to the functionality of the Boolean expression obtained in section (ii) above?

(iv) Construct a logic circuit for the Boolean expression obtained in section (ii) above with NOT, AND and OR gates only.

2. (a) The IP address 125.214.169.218 is assigned to the server www.doenets.lk. The **ping 125.214.169.218** command issued from the machine A reported a round trip time (RTT) of 20 ms.

However, the **ping www.doenets.lk** command, issued some time later from the machine A, reported an error.

(i) Draw a network diagram to depict the server, machine A and any other required components to describe the above scenario.

(ii) Identify **two** possible causes for the above behaviour and explain them using the diagram developed in section (a) (i) above.

(b) An organization has only one public IP address, 192.248.17.1, allocated to it. The organization has decided to allow web browsing on the computers on its LAN with 100 computers. It also wants to optimize the usage of its Internet connection by reducing the traffic on the link as much as possible.

Draw a network diagram to satisfy the above requirements. Explain the major decisions you made.

3 The National University of Information Technology is a well-recognized university. They offer both bachelors and post-graduate degree programmes, diplomas as well as short courses in information technology and business management. All teaching of the above courses is being conducted at their sophisticated classrooms and state-of-the-art computer laboratories specifically designed to provide a student-centred interactive learning experience. The management of the university has realized that their brand name has become well known in the country as the number of inquiries they receive from far away provinces has increased. Furthermore, a recent study has revealed that their short courses and diplomas are also very popular among working professionals despite the burdens of their busy work schedules as well as the limited time available to devote for education. Hence, the management has proposed to start a distance education programme with the objectives of providing new value added services and capturing new markets.

(a) Propose an ICT based system to implement the above distance education programme. Describe its main components by using a simple diagram.

(b) Explain **three** advantages of the proposed system.

(c) Discuss **three** challenges of the proposed system.

(d) The management thinks that agent technology based techniques could be used to overcome some of the above challenges. Do you agree with this statement? Justify your answer.

4 (a) Explain why compilers or interpreters are needed when using high level programming languages.

(b) Your teacher has requested you to write a Python program to record the marks obtained by students at the term test. Each student has sat for the same three papers and each mark was given as an integer value out of 100 marks. Each student is identified by a unique index member which is also an integer. You should record the marks of student in a text file named 'marks.txt' in the following format.

Index_no_1,mark_11,mark_12,mark_13
Index_no_2,mark_21,mark_22,mark_23
.....

Where

Index_no_X : Index number of the X^{th} student; X = 1, ..., n
mark_XY : Marks obtained by the X^{th} student for the Y^{th} paper; Y = 1, 2, 3

Index numbers and marks of the students should be entered through the keyboard, one item at a time and the program should be terminated when -1 is entered as the index number.

(i) Propose an algorithm by using a flowchart for the program.

(ii) Write a Python program to implement your flowchart.

5. A pharmacy named "DR Chemists" sells drugs to patients. A patient should produce a prescription to a pharmacist at the pharmacy to buy drugs. A prescription has one or more drugs prescribed by a doctor. A doctor can issue more than one prescription for a patient. However, a prescription is issued by one doctor. Pharmacist prepares a bill for each prescription and gives it to the patient. Five (05) pharmacists at the pharmacy handle all prescriptions.

   A pharmacist handles more than one prescription while one prescription is handled only by one pharmacist. The upper part of the prescription contains the patient information such as name, age, address and telephone number. The middle part of the prescription consists of one or more drug names, quantities to be issued and the dosages. At the bottom part name, address and telephone number of the hospital and the name of the doctor are available.

   The owner of the pharmacy wants to keep the necessary information to prepare the following list of reports.

   1. Number of prescriptions handled by each pharmacist.
   2. Number of prescriptions issued by each doctor.
   3. List of information about doctors, their hospitals and drugs prescribed by them.
   4. List of daily cash collection of the pharmacy.

   Prepare an ER diagram to model the data required to produce the above reports. State clearly all your assumptions, if any.

6. Draw a context diagram to show the overview of the library system described below. Clearly indicate external entities and data flows of your diagram and state any acceptable assumptions that you have made.

   The National Information Technology Library (NITL) provides e-books to its users through an online system named "Library Information Processing System (LIPS)".

   A person should submit an application to NITL to become a member of the LIPS. The NITL evaluates the application and enters it to the LIPS, if it is approved. After entering the application data, LIPS issues an activation code to NITL which in turn passes it to the relevant person. Once the activation code is received the person becomes a member of LIPS. A member can obtain his/her username and password by providing the activation code to the LIPS. A member can subsequently access e-books by entering his/her username and the password to the LIPS.

* * *

Part II - A

Question No	Part	Answer	Marks
2	a	Send Text Message Fill in all the fields and click Send Message <form action="" method="POST"> Phone No.: <input type="text" name="phone" size="20" > Message: <textarea name="message" rows="7" cols="30"></textarea> <input type="submit" value="Send your message" > </form>	1 1 1
	b	Possible Answers : 1. source link is incorrect. 2. browser does not support images 3. Problem in downloading image (Network Problem)/timeout 4. Image has been corrupted.	1 mark *2 2 Marks
	c (i)	Incorrect p{font-family : Arial;}	1 1
	c(ii)	Incorrect body{ color: red; background-color: yellow; } or body{color: red;} body{ background-color: yellow;}	1 1
	(iii)	Correct	1

(1) (a) 3. (2) (a) 4 (3) a - 3 (4) (a) 4
(b) 2 (b) b b-5 (b) b
(c) 5. c-2

2	a(i)	00001010	1
	a(ii)	11100111	1
	a(iii)	Add two numbers together 11110001 (Optional)	1
	a(iv)	Check the most significant bit. If it is 0, the sign is positive, just convert the number to decimal. (Optional) If it is 1, the sign is negative, perform the 2's complement.	1
	b(i)	Possible answers ***Security, Privacy, Reliability***	1 Mark 2 – 2 Marks
	b(ii)	Yes. Justification : B2C or Business to Consumer" is a business transaction where products and services are sold through the Internet for convenience of consumers. Internet banking is a B2C form of a service organization where banking services are offered to customers online.	1 Mark 1 Mark
	b(iii)	Yes. A bank usually evaluates certain conditions to screen loan applications before sending the application for further processing and approval. These conditions are domain specific and usually checked by a domain expert. Note: As the decision making process involves reasoning under uncertainty, lack of data etc. and can be implemented as a set of If-Else conditions, it could be automated as an expert system. That expert system could be used to provide a loan pre-processing interface for loan applicants to check their suitability to apply for a loan before submitting an application to the bank.	1 Mark 1 Mark

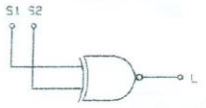
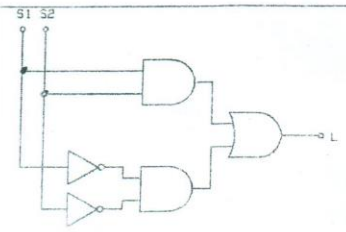
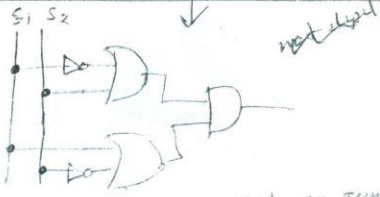
3	a(i)	YES or closed	1
	a(ii)	Energy cannot be created or destroyed	1
		Therefore no possibility of new energy coming from outside and destroyed energy going out.	1
	b(i)	instituteCode + unitCode	1
	b(ii)	NOT NULL,	1
		PRIMARY KEY,	2
		FOREIGN KEY	1
	c(i)	3	1
	c(ii)	4	1
4	(a)	Address size = 32 bits No. of unique addresses = 2^{32}	1
		Max no. of bytes uniquely addressable = 2^{32}	1
		Max no. of bytes usable = $2^{32} = 2^2 \times 2^{30}$ Max usable size of memory = 4GB	2

(b)

Current state	Next possible state	Condition for transition from the running state
Running	Exit	Completion of the process
	Ready	Allowed time slice finished
	Blocked	Event wait

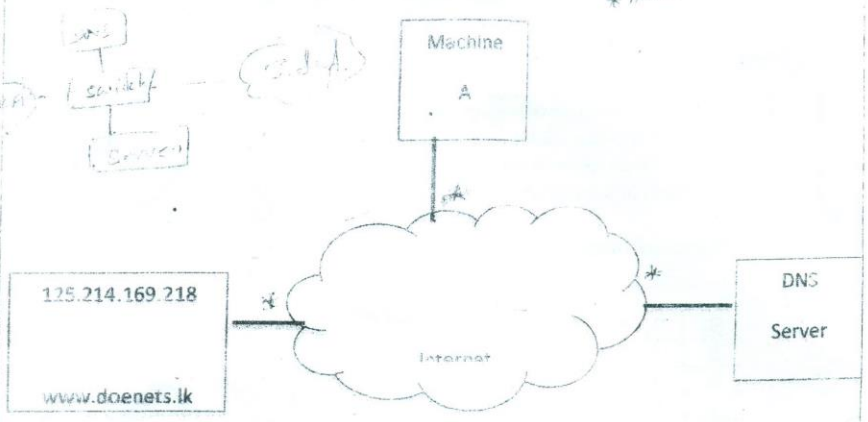
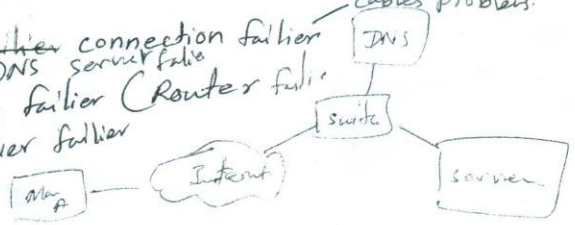
1 Mark * 6 = 6 Marks

Part II - B

Ques No	Part	Answer	Marks
1)	a	Case 1: Logical truth value of output is 1 Sum of products (SOP) Case 2: Logical truth value of output is 0 Products of sums (POS) Any of the above cases, 3 mark	3
b)	i)	S_1 | S_2 | L 0 | 0 | 1 0 | 1 | 0 1 | 0 | 0 1 | 1 | 1	4
	ii)	$S_1'.S_2' + S_1.S_2 = L$ or $(\overline{S_1}+S_2)\cdot(S_1+\overline{S_2})$ Complete statement	3
	iii)	XNOR Gate or 	2
	iv)	 or  Complete diagram 3 marks (if not 0 mark)	3

(1) (a) 3 (2) (a) 7 (3) (a) 3 (4) (a) 3 (5) 8 (6)
(b) 12 (b) 8 (b) 6 (b) 85 5
(c) 3 (c) 7 2
(d) 3

(2)
(a)
I/

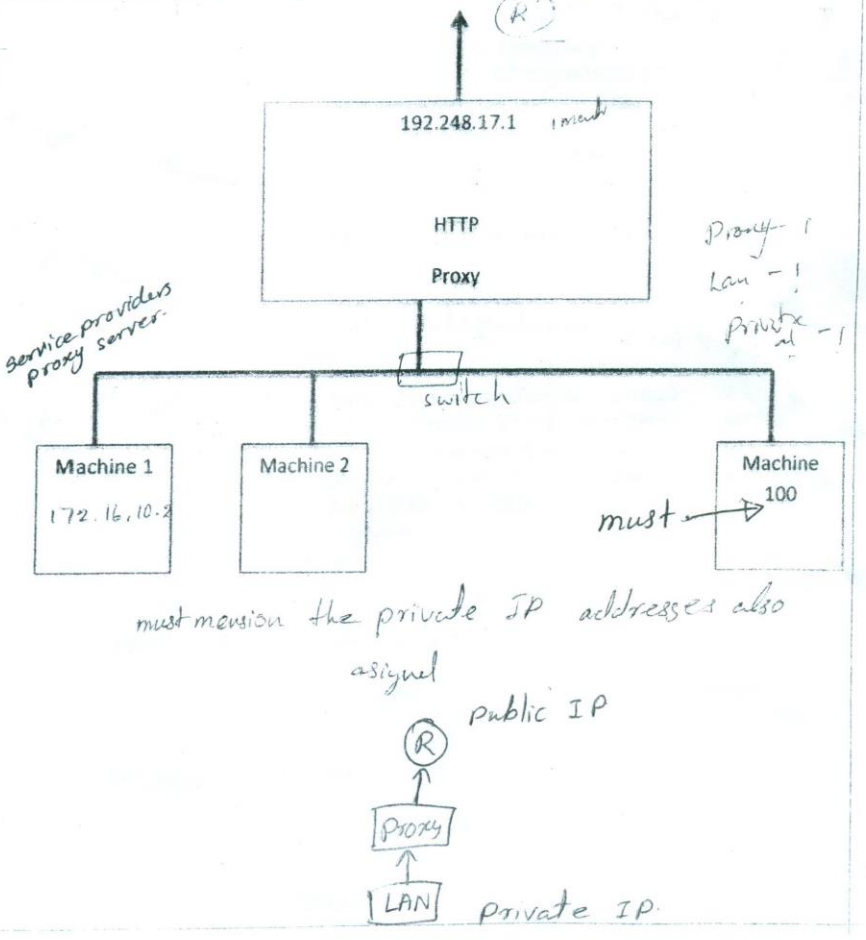
		Marks
a(i)		3
a(ii)	Identify, two possible causes for the above behavior and explain using the diagram developed in section Network ~~failier~~ connection failier (cables problems) DNS server failie Router connectivity failier (Router fail. server failier  	4

b) Diagram (2 marks for proxy server, 1 mark for LAN and 1 mark for showing public IP at proxy server)

Private IP ranges. Any of range within the following: (1 mark)

10.0.0.0 – 10.255.255.255
172.16.0.0 – 172.31.255.255
192.168.0.0 – 192.168.255.255

The proxy server can also be used as a cache to optimize the usage of internet connectivity (or similar meaning). (3 marks)



(3)

3) a Identification of "E learning system"/ "E education platform" (or similar) 1

Note: If Learning Support System is written as the answer, the environment needs to be mentioned as e learning.



b
i. Learning at preferred times
ii. No geographical barriers
iii. Increase employment opportunities
iv. Online testing
v. Less operational costs
vi. Learning at own phase

(1 mark for list of advantages and 1 mark for explanation)

c
i. How to facilitate active teacher student interactions
ii. Getting students to interact with other students
iii. Conducting practical examinations
iv. Course material preparation
v. Evaluation of the learning process and progress
vi. Lack of ICT resources and infrastructure
vii. Initial cost is high.

3

d
Yes/No (if the challenges are not related to agent technology) (1 mark)

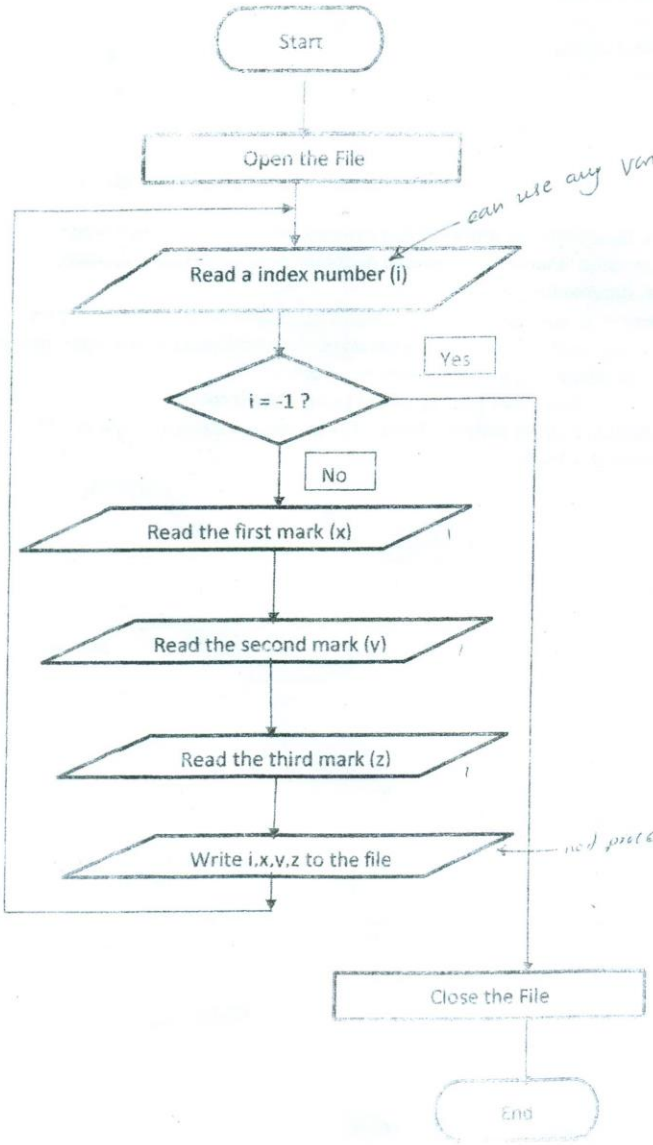
Explanation including any two of the below (2 marks)

i. Material preparation agent (locating materials from the web)
ii. Learning process management agent (Appropriate learning sequence/lesson planning)
iii. Learner support agent (Identification of weak performers, providing additional learning resources, etc.)
iv. Collaboration support agent
v. Assessment agent

3

4

Programs written in high level languages cannot be understood by the processors of a computer. Thus Interpreters/Compilers are needed to convert the programs in high level languages to the language understood by the computer (Machine languages). 03



Start and End 1 mark x 2

1

1

Read 3 inputs 1 mark

5

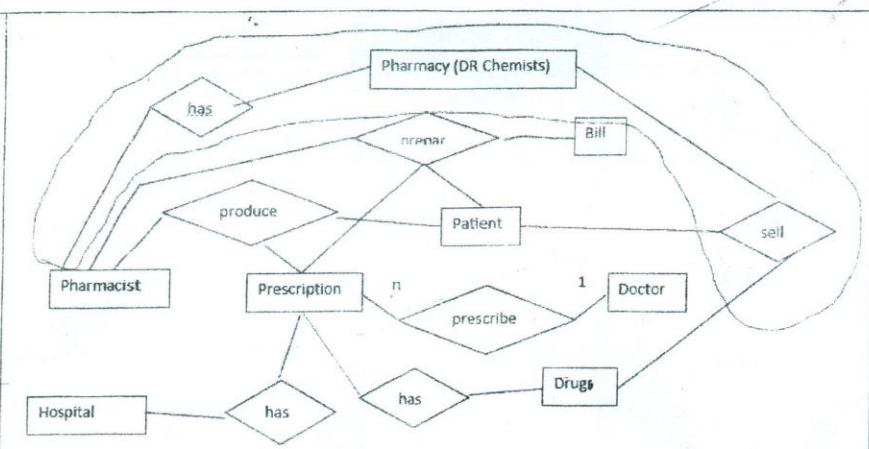
1

b(ii)

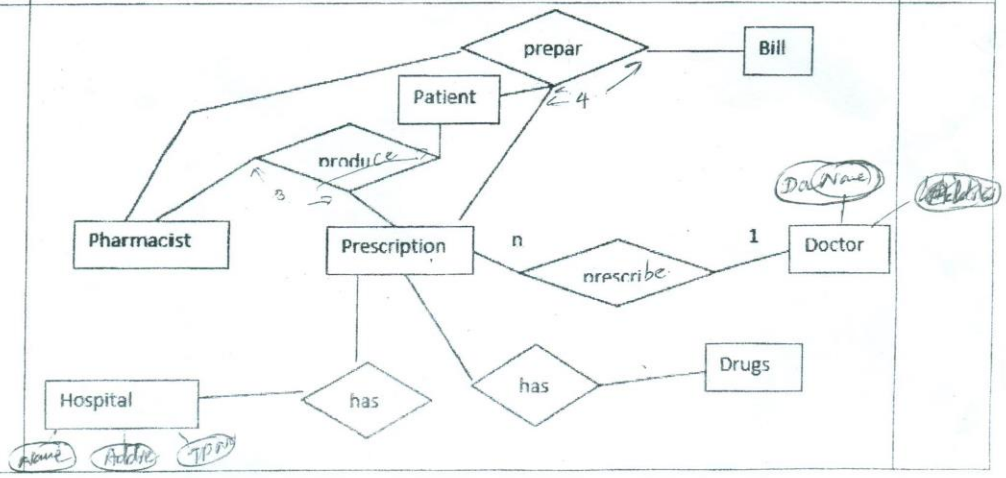
```
f = open("marks.txt","w")
index_no = int(input("Enter the next index no :"))
while (index_no != -1):
    x = input("Enter the first mark :")
    y = input("Enter the second mark :")
    z = input("Enter the third mark :")
    data = str(index_no)+","+x+","+y+","+z+"\n"
    f.write(data)
    index_no = int(input("Enter the next index no :"))
f.close()
```

- correct open statement = 1 Mark (Should have the left side variable to = + open keyword + file name "marks.txt" in double quotation + "w" in double quotation,
- correct close statement= 1 Mark
- correct statement to read an index no = 1 Mark (the result may be converted to int)
- Correct loop statement = 1 Mark (while keywoed + correct comparison -- index_no can be a string or an integer depending on how it is read)
- Reading marks = 1 Mark – if at least syntax of a single line is correct
- Making the output string to write = 1 Mark – f.write needs a string as its parameter
- Writing to the file = 1 Mark

5)

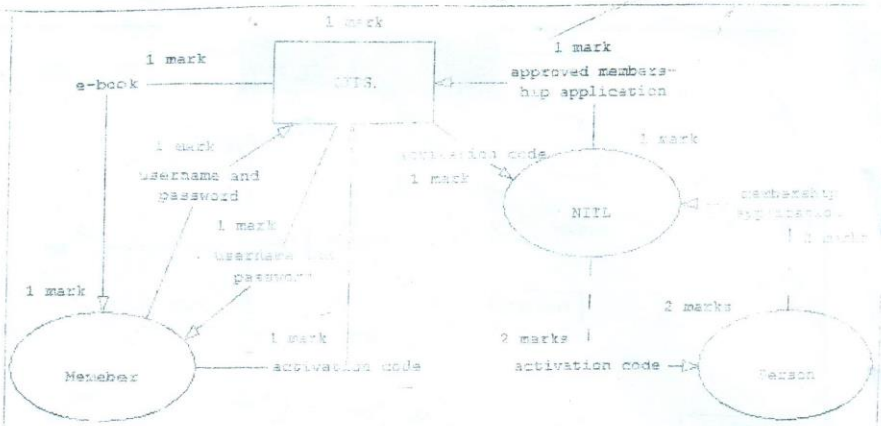


1 mark – each entity (1 x 8 entities)
1 mark – each relationship (except relationships with Pharmacy entity) (1 x 5 relationships)
2 mark – Correct attributes attached to Hospital and Doctor entities (1+1)
+1 all are connected to each other



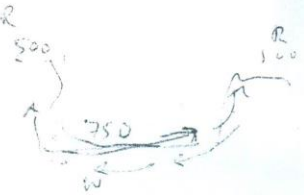
6)

6)



Strictly follow standard notations.
Data flows between External Entities should be specified with dotted lines.

TCP වලින් ගොඩක් segment එකක් ලබා bytes ගොඩක් ලබා එවීම
සම්පූර්ණ වෙනවා. නමුත් මේ ක්‍රියාවලිය වැඩ කරන්නේ
(ඒක කරන්නේ කොහොමද) නමුත් යම් වේලාවක් ඇතුලත ඒක Timeout වෙනවා
අදාළ line එක හොඳින් ලැබුණා නම් ඒකෙන් ලබා ගත් bytes acknowledge
කළ බව එය යවන්නාට දන්වනවා.



මේ පිළිබඳ යම් දැනුම්දීමක් සඳහා
පහත දුරකතන අංක භාවිතා කරන්න.

0112-784037
0112-785231
0112-785216

සැමවනුට මෙන්ත පලිතය සරවන අදාළයි.

Byte addressable.
word addressable. < 2
4