

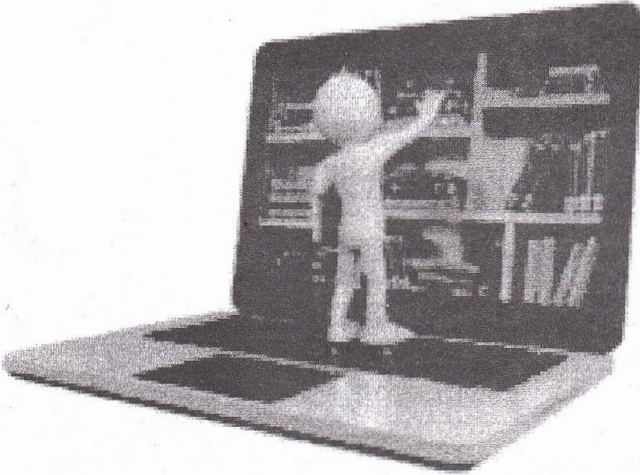


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Department of Examinations - Sri Lanka

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

**20 - Information & Communication
Technology
Marking Scheme**



PAPERMASTER.LK

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.

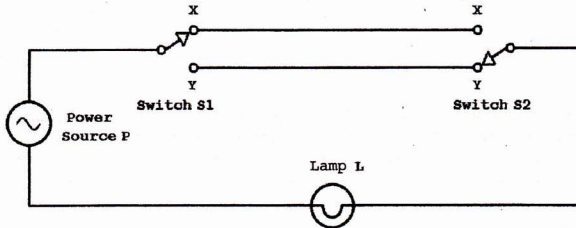
Part II - A

Question No	Part	Answer	Marks
1	a	<pre> <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="text" name="phone" size="20" ></div> </div> <div class = "a"> <div class = "l">Message:</div> <div class = "r"><textarea name="message" rows="7" cols="30"> </textarea></div> </div> <div class = "a"> <div class = "r"><input type="submit" value="Send your message" ></div> </div> </form> </pre> <p style="text-align: right;">case Sensitive " or '</p>	<div>1</div> <div>1</div> <div>1</div>
	b	<p>Possible Answers :</p> <ol style="list-style-type: none"> source link is incorrect. browser does not support images Problem in downloading image Image has been corrupted. 	<div>mark *2</div> <div>2 Marks</div>
	c (i)	Incorrect p{font-family : Arial;}	<div>1</div> <div>1</div>
	c(ii)	<p>Incorrect</p> <pre> body{ color: red; or body{color: red;} background-color: yellow; } body{ background-color: yellow; } </pre> <p>no consider only 'Correct'</p>	<div>Correct - 1</div> <div>1</div>
	(iii)	Correct	1
	c(ii)	<p>Correct (1)</p> <p>Incorrect</p> <p>+</p> <p>P {font-family : Arial; } }</p>	<div>(1)</div> <div>(1)</div>

2	a(i)	00001010	1
	a(ii)	11100111	1
	a(iii)	Add two numbers together 11110001 (Optional) <i>not consider carry-over, must be added</i>	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. <i>convert the number to decimal</i>	1
	b(i)	Possible answers Security, Privacy, Reliability <i>Hacking</i>	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 can be used +, , and	1										
	b(ii)	NOT NULL, PRIMARY KEY, FOREIGN KEY	1 2 1										
		<i>Def Type - Domain integrity FK - Referential integrity PK - Entity integrity</i>											
	c(i)	3	1										
	c(ii)	4	1										
4	(a)	Address size = 32 bits No. of unique addresses = 2^{32} Max no. of bytes uniquely addressable = 2^{32} Max no. of bytes usable = $2^{32} = 2^2 \times 2^{30}$ Max usable size of memory = 4GB	1 1 2										
	(b)	<table><tr><th>Current state</th><th>Next possible state</th><th>Condition for transition from the running state</th></tr><tr><td rowspan="3">Running</td><td>Exit <i>Terminated</i> <i>finish</i></td><td>Completion of the process</td></tr><tr><td>Ready <i>waiting</i> <i>24/27/6/2/3</i></td><td>Allowed time slice finished / <i>Time out</i></td></tr><tr><td>Blocked <i>finish</i></td><td>Event wait</td></tr></table>	Current state	Next possible state	Condition for transition from the running state	Running	Exit <i>Terminated</i> <i>finish</i>	Completion of the process	Ready <i>waiting</i> <i>24/27/6/2/3</i>	Allowed time slice finished / <i>Time out</i>	Blocked <i>finish</i>	Event wait	1 Mark * 6 = 6 Marks
Current state	Next possible state	Condition for transition from the running state											
Running	Exit <i>Terminated</i> <i>finish</i>	Completion of the process											
	Ready <i>waiting</i> <i>24/27/6/2/3</i>	Allowed time slice finished / <i>Time out</i>											
	Blocked <i>finish</i>	Event wait											

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.

- Construct a truth table to represent the functionality of the above circuit.
- Derive a Boolean expression to represent the truth table obtained in section (i) above.
- What is the logic gate which is equivalent to the functionality of the Boolean expression obtained in section (ii) above?
- Construct a logic circuit for the Boolean expression obtained in section (ii) above with NOT, AND and OR gates only.

Ques No	Part	Answer	II - Part A	Marks															
1)	a	<p>Case 1: Logical truth value of <u>output</u> is 1 Sum of products (SOP)</p> <p>Case 2: Logical truth value of <u>output</u> is 0 Products of sums (POS)</p> <p>Any of the above cases, 3 mark</p>		3															
b)	i)	<table border="1"> <thead> <tr> <th>S₁</th><th>S₂</th><th>L</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>0</td></tr> <tr> <td>1</td><td>1</td><td>1</td></tr> </tbody> </table> <p>or output, if not define output deduct 1</p>	S ₁	S ₂	L	0	0	1	0	1	0	1	0	0	1	1	1		4
S ₁	S ₂	L																	
0	0	1																	
0	1	0																	
1	0	0																	
1	1	1																	
	ii)	$S_1' S_2' + S_1 S_2 = L$ or $(S_1 + S_2) \cdot (\bar{S}_1 + \bar{S}_2) = L$ or with or without L Complete statement		3															
	iii)	<p>XNOR Gate or</p> <p>or</p>		2															
	iv)			3															

Complete diagram 3 marks (if not 0 mark)

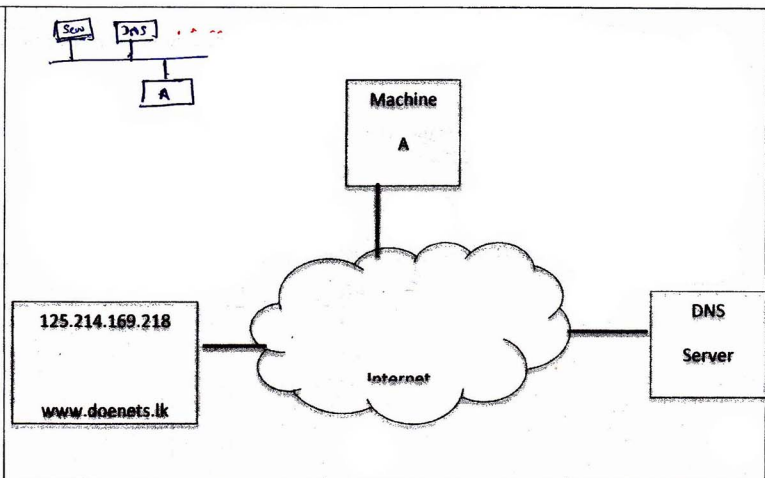
Complete diagram 3 marks (if not 0 mark)

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.

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

2)	<p>a(i)</p> 	3
	<p>a(ii)</p> <p>Identify, two possible causes for the above behavior and explain using the diagram developed in section</p> <ul style="list-style-type: none"> * Not correct DNS server - failure * Not configure DNS server - configuration problems * Network down in second time - network problems. 	<p>4</p> <p>2x2=4</p>

- 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)

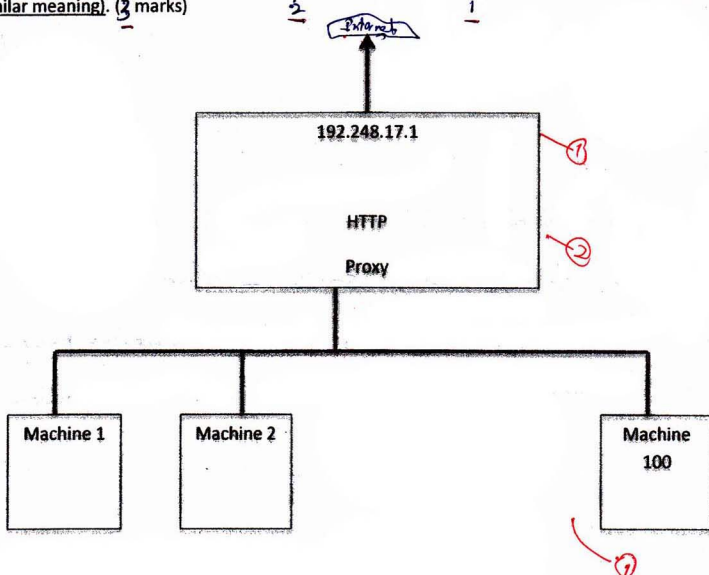
10.0.0.0 – 10.255.255.255

172.16.0.0 – 172.31.255.255

192.168.0.0 – 192.168.255.255


Solved

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



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.

- Propose an ICT based system to implement the above distance education programme. Describe its main components by using a simple diagram.
- Explain **three** advantages of the proposed system.
- Discuss **three** challenges of the proposed system.
- 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.

3)	a	<p>Identification of "E learning system"/ "E education platform" (or similar)</p> <p>Note: If Learning Support System is written as the answer, the environment needs to be mentioned as e-learning.</p>  <p><i>LMS</i></p>	1
	b	<ul style="list-style-type: none"> i. Learning at preferred times ii. No geographical barriers iii. Increase employment opportunities iv. Online testing v. Less operational costs vi. Learning at own <i>phase pace</i> <p><i>Save one or more people at a time</i></p> <p>(1 mark for list of advantages and 1 mark for explanation)</p> <p><i>explanation with points 6 or 6-1 = 5 without point form</i></p>	6
	c	<ul style="list-style-type: none"> 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 <p><i>Identification a user uniquely</i></p>	3
	d	<p><u>Yes/No</u> (if the challenges are not related to agent technology) (1 mark)</p> <p>Explanation including any <u>two</u> of the below (2 marks)</p> <ul style="list-style-type: none"> 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. (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 Xth student; X = 1,, n

mark_XY : Marks obtained by the Xth student for the Yth 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.

4)	a	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
	b(i)	<pre> graph TD Start([Start]) --> Open[Open the File] Open --> ReadIndex[/Read a index number (i)/] ReadIndex --> Decision{i = -1?} Decision -- Yes --> Close[Close the File] Close --> End([End]) Decision -- No --> ReadX[/Read the first mark (x)/] ReadX --> ReadY[/Read the second mark (y)/] ReadY --> ReadZ[/Read the third mark (z)/] ReadZ --> Write[/Write i,x,y,z to the file/] Write --> ReadIndex </pre>	<p>Start and end 1 mark</p> <p>1</p> <p>1</p> <p>Read 3 inputs 1 mark</p> <p>1</p>
	b(ii)	<pre> 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() </pre> <p><i>r+, a</i></p> <ul style="list-style-type: none"> 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 	<p>70</p>

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.

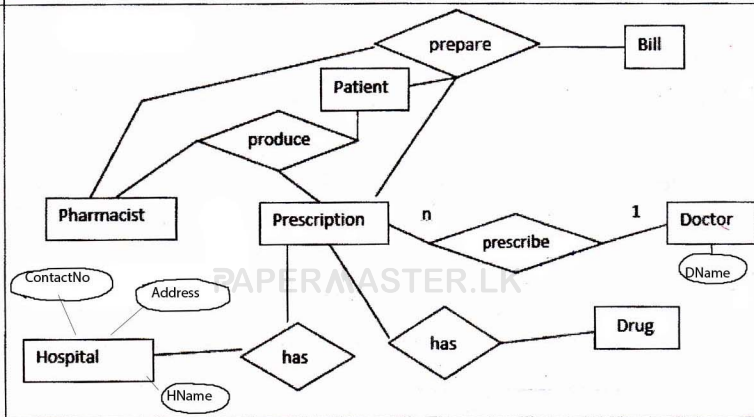
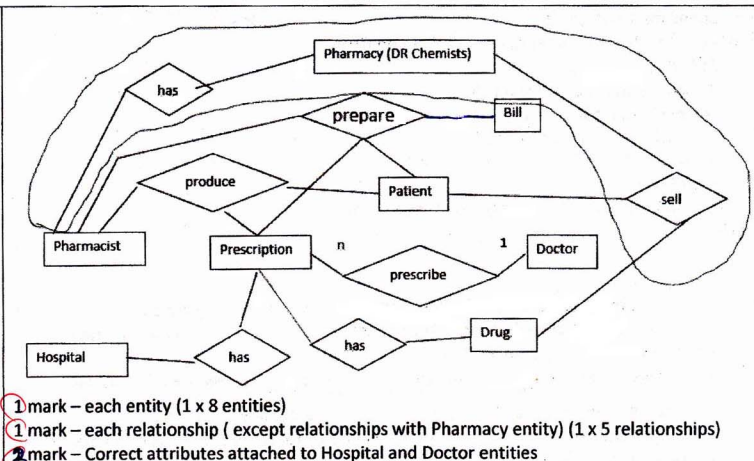
A pharmacist handles more than one prescription while one prescription is handled only by one pharmacist. The upper part of the prescription contains the patient information such as name, age, address and telephone number. The middle part of the prescription consists of one or more drug names, quantities 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.

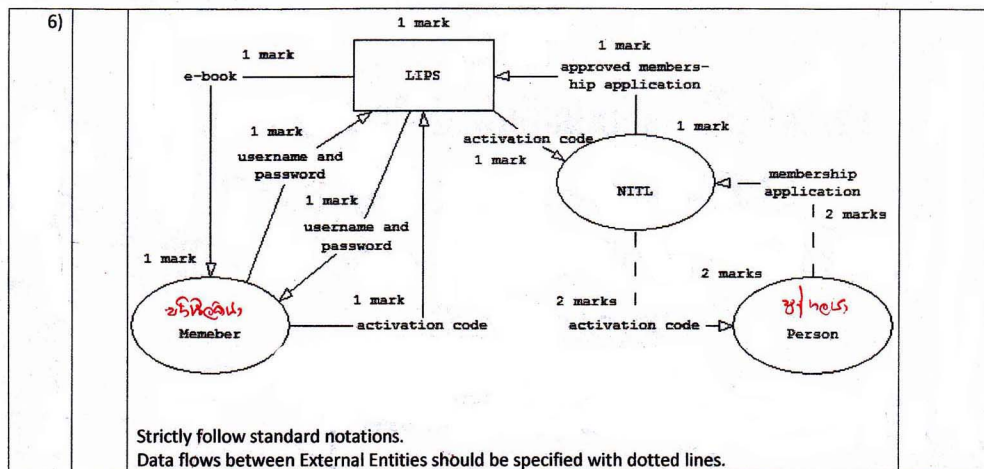
5)



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 I

Q. No	Answer	Q. No	Answer	Q. No	Answer	Q. No	Answer	Q. No	Answer
1	4	11	2	21	5	31	5	41	4
2	5	12	3	22	1	32	1	42	2
3	3	13	1,4	23	5, 1(T)	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	2,4	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

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