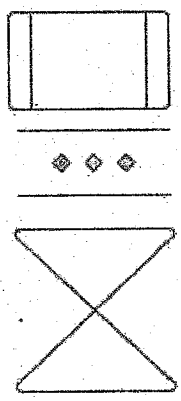
Confidential

Department of Examinations, Sri Lanka

G.C.E. (A/L) Examination – 2024

20 – ICT

Mark Scheme



This document has been prepared for the use of marking examiners. Some changes would be made according to the views presented at the Chief Examiner's Meeting.

Amendments are to be included.

Example: **Question No. 03**

(i) ..... √ 4/5

(ii) ..... √ 3/5

(iii) ..... √ 3/5

03 (i) $\frac{4}{5}$ + (ii) $\frac{3}{5}$ + (iii) $\frac{3}{5}$ = $\frac{10}{15}$

5. Write down the marks given for each question against the question number in the relevant cage on the front page in **two digits**. Selection of questions should be in accordance with the instructions given in the question paper. Mark all answers and transfer the marks to the front page, and write off answers with lower marks if extra questions have been answered against instructions.

6. Add the total marks carefully and write in the relevant cage on the front page. Turn pages of answer script and add all the marks given for all answers again. Check whether that total tallies with the total marks written on the front page.

7. **Rounding off of 0.5 marks** should only be done to the **final total for Paper II.**

1.4 Preparation of Mark Sheets

1. The final marks of the two papers will **not** be calculated within the Evaluation Board. Therefore add separate mark sheets for each of the question papers. Enter Paper I marks in "Total Marks" column of the mark sheet and write them in words as well. Enter Paper II marks in the "Total Marks" column and include the relevant details.

2. The final marks for Paper I and Paper II should always be rounded up to the nearest whole number and they should never be kept as decimal or half values.

3. Each page of the mark sheet should be compulsorily verified by the Examiner who entered marks to the mark sheet, Examiner who checked the mark sheet, the Verifying Examiner and the Chief Examiner by placing respective code numbers and the signatures.

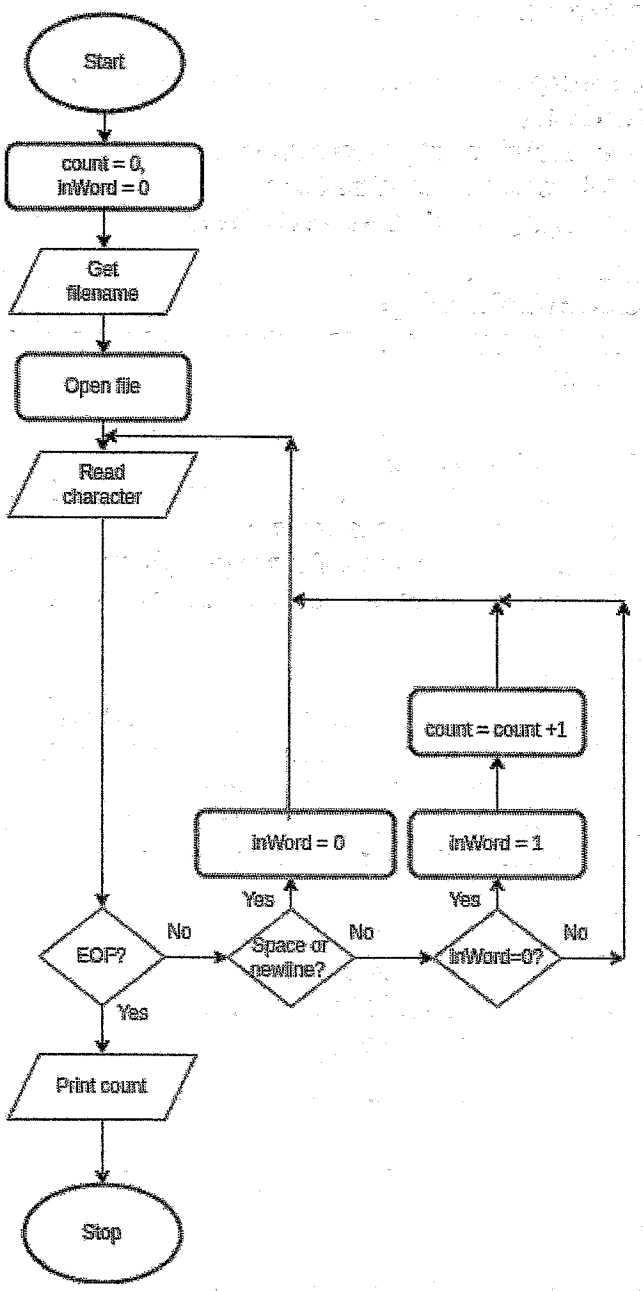
3 Paper II mark scheme

Notes:

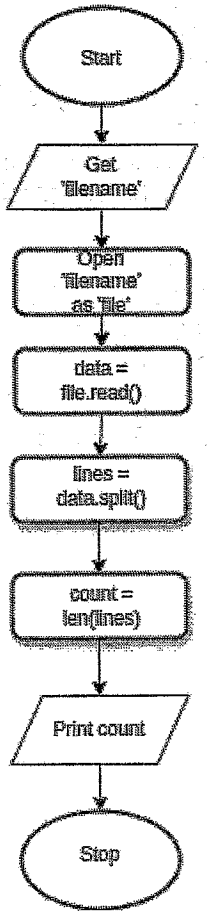
1. Essential keywords sufficient for credit in some answers are underlined.
2. Acceptable alternatives for a given word or set of words are separated by slashes.
3. <--A indicates that any credit for the item should be given only if A is correct.
4. Answers where *minor* spelling mistakes are acceptable 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.

Qn	Answer	Marks
1(a)(i)	action select /select radio radio submit Submit **Notes:** 1. Ignore case defects. 2. Exact spelling needed. 3. No partial marks. 4. Order is important.	1 1 1 1
1(ii)	**Any one of the following:** • the action_page.php file/script/code is executed • run/execute php file/script/code • collected data is submitted to action_page.php for processing • The form data is validated and sent to the specified page (action_page.php) for processing **Notes:** 1. 'stored in the action_page.php file' not accepted.	1
1(iii)	**Any one of the following:** • It will validate the email address. • It will check whether the email address is in proper form.	1

Qn	Answer	Marks
2(a)(i)	A: input/data B: process/processing C:output/information **Notes:** 1. No partial marks.	1
2(a)(ii)	**Activity 1:** **Input:** username, password / username / email / user login details **Process:** checking whether input valid / user validation (authentication) **Output:** letting user in / display home page (welcome message) **Notes:** 1. For **input**, student writing just 'password', is NOT acceptable. **Activity 2:** **Input:** item(s) to purchase / selecting the items to purchase **Process:** compute total cost for the (selected items / items in the trolley); searching the selected items and putting them to trolley **Output:** total cost / display total cost **Activity 3:** **Input:** (debit) card information **Process:** Do the payment process to do the fund transfer for the amount that has to be paid / debit card validation / bank processing / accessing the payment gateway **Output:** confirmation of payment ; initiate the stationery delivery process ; showing the details relating to the payment	1 (If only two correct: **0.5 marks**) 1 (If only two correct: **0.5 marks**) 1 (If only two correct: **0.5 marks**)

Qn	Answer	Marks
3(a)	**Alternative 1:** 	

Alternative 2:



Notes:

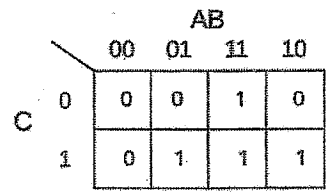
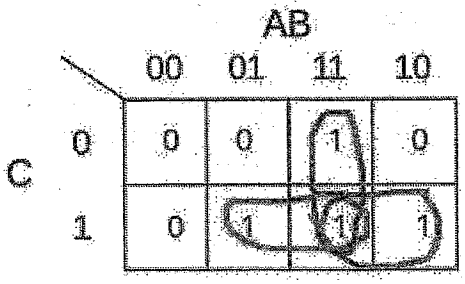
1. Synonyms for 'Get', 'Print' acceptable.

Marks allocation for Alternative 2:

A: initial flow-chart segment containing opening filename (<- correct flow-chart symbols)	**0.5**
B: flow-chart segment for reading 'file' into a variable ('data') (<- **A**, correct flow-chart symbols)	**0.5**
C: splitting 'data' into 'lines' (<- **B**, correct flow-chart symbols)	**0.5**
D: Getting the length of 'lines' and printing it (<- **C**, correct flow-chart symbols)	**0.5**

Qn	Answer	Marks
4(a)	1. Feasibility study 2. System analysis 3. System design **Notes:** 1. Order important. 2. No partial marks.	1
4(b)	**Any one of the following:** • Helps getting feedback and approval from clients • Provides early visualization for clients • Helps in properly designing the system / Helps in finding missing functionality / Helps in refining requirements / Helps the developers understand the user requirements better • Helps in early discovery of design problems / errors • Helps in cost / resource estimation • Ensures greater level of client satisfaction • Makes users actively involved in the development process • Helps developers and users both understand the system better • Bridges the communication gap between developers and users • Could be reused by the developer for other similar projects • Reduces risks of project failure	1

4(d)	use **Notes:** 1. Synonyms for 'use' also acceptable. (e.g., navigate, interact with etc.)	**1**
4(e)	small / low	**1**
4(f)	A method that the manager can use: • Assign weights to each feature (F1 and F2) based on their importance. Also assign weights to the acquiring and usage costs. • For each option (A, B, and C), evaluate how well it meets each feature and assign marks. Assign marks to the costs of the systems too (lower the cost, the higher the assigned mark). • Multiply the marks by the weights for each criterion and sum them up to get the total score for each option. • The option with the highest total weighted score is the most suitable choice. **Marks allocation:** **A:** Giving marks to each option based on how much they satisfy F1 and F2 **B:** Giving marks to the costs **and** finally choosing the best option	 **0.5** **0.5**

5(c)(ii)	 **Notes:** 1. Indicating all 1's and 0's are compulsory. Give **one** mark for each correct row.	2
5(c)(iii)	 AB + BC + AC **Marks allocation:** **A:** marking all three loops on the correct Karnaugh map **B:** final expression (<--A) **Notes:** 1. For mark component B, the term Z is not compulsory. 2. Cells containing 0's not being indicated on the Karnaugh map is permissible for this part.	 1 1

How it differs from combinational logic gates:

Flip-flops	Combinational logic gates
sequential circuit / output depends on time and past states	combinational circuit / output depends only on inputs
stores data / works as a memory element	no memory / outputs are based solely on current inputs
synchronized with clock pulses	No clock; outputs change instantly with inputs
used to store and transfer data / used in memory elements	performs logic operations

Marks allocation:

A: description (how a FF works as a memory element) 1

B: any one of the comparisons 1

Notes:

1. For mark component B, a comparison should include both sides of the table; if only one side given, give only **0.5 marks** for B.

5(d)(iii) **2**

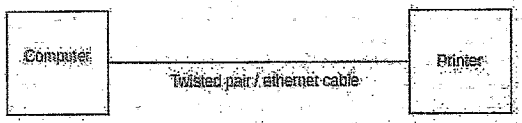
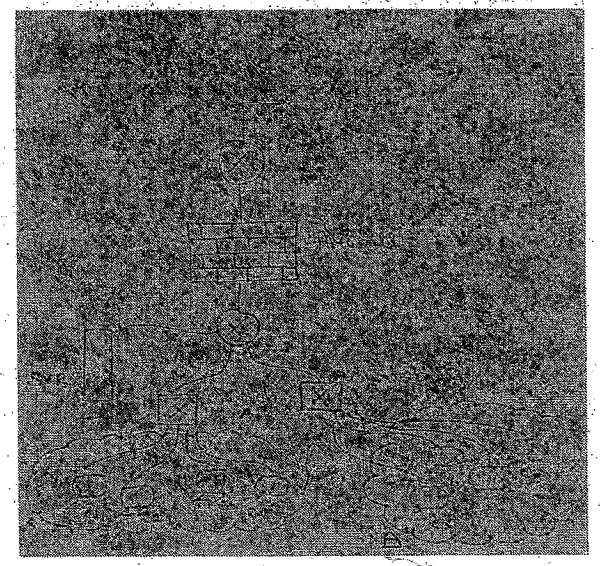
INPUT			OUTPUT	
A	B	C-IN	C-OUT	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

The total mark is decided as follows:

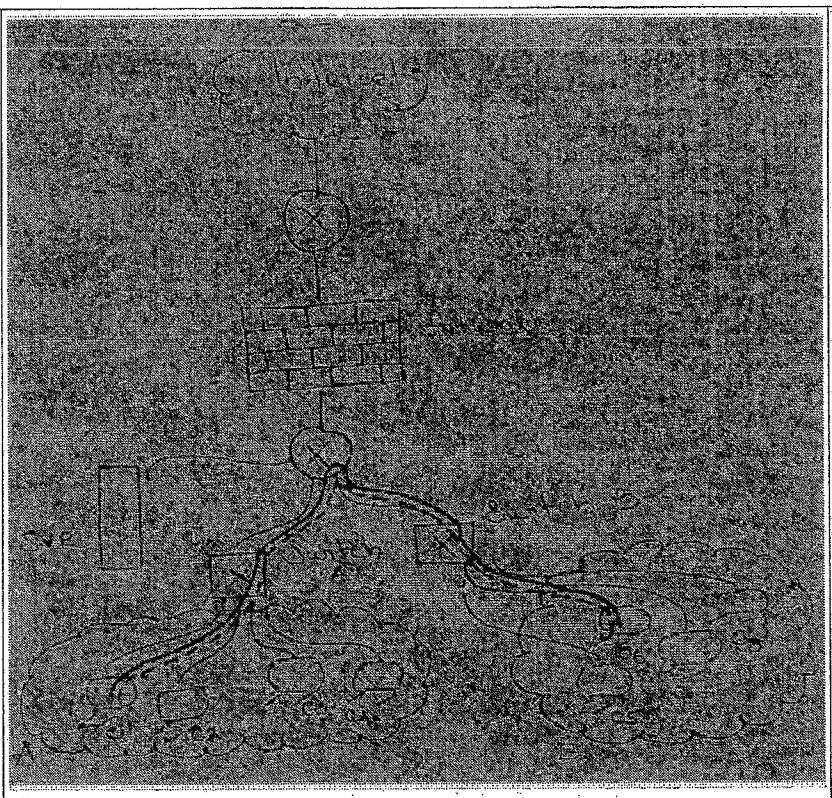
Maximum no. of Rows correct	Marks
8	2
5,6,7	1.5
3,4	1
1,2	0.5

Notes:

1. 'Input', 'Output' titles could be ignored.

Qn	Answer	Marks
6(a)		1
6(b)(i)	 **Notes:** 1. The 'firewall' is optional. **Marks allocation:** **A:** Department A and B LANs with correct placement of two switches (marked A,B) **B:** Correct SVR, router and Internet connectivity	 0.5 0.5
6(b)(ii)	**Any one of the following:** • switches: to provide each LAN's connectivity to the Router • switches: to give a connection to each computer of each LAN • router: to provide the connection to the internet • router: to provide the connectivity between the LANs • firewall: to filter out the unwanted traffic **Notes:** 1. To get this mark, the relevant device must be correctly placed on the student's diagram for 6(b)(i). 2. The SVR can be placed in one of the LANs as well.	1

6(b)(iii) — 1



Notes:

1. To get this mark, the C1 -> switch -> router -> switch -> C6 path must be available on the student's diagram for 6(b)(i).

6(c)(i) — 255.255.255.0 — 1

6(c)(ii)

Subnet	Network address	first usable IP address	Last usable IP address	Broadcast address	
S1	192.168.100.0	192.168.100.1	192.168.100.30	192.168.100.31	0.5
S2	192.168.100.32	192.168.100.33	192.168.100.62	192.168.100.63	0.5
S3	192.168.100.64	192.168.100.65	192.168.100.94	192.168.100.95	0.5
S4	192.168.100.96	192.168.100.97	192.168.100.126	192.168.100.127	0.5
S5	192.168.100.128	192.168.100.129	192.168.100.158	192.168.100.159	0.5
S6	192.168.100.160	192.168.100.161	192.168.100.190	192.168.100.191	0.5

Two other alternatives:

	192.168.100.192	192.168.100.193	192.168.100.222	192.168.100.223 (0.5)
	192.168.100.224	192.168.100.225	192.168.100.254	192.168.100.255 (0.5)

Notes:

1. **0.5 marks** for each correct row (for a maximum mark of **3**)

6(d)(i)	Provide a look-up service to provide the corresponding ip address(es) relevant to the given URL **Notes:** 1. Give the mark if the student gives a similar answer.	1
6(d)(ii)	**Hierarchical:** The DNS hierarchy consists of multiple levels of servers to direct Internet traffic efficiently. **Distributed:** There are many servers having the portions of the DNS records in a distributed manner in multiple locations in the internet	1.5 0.5
6(e)(i) (ii) (iii) (iv)	application layer network access layer internet layer internet layer	0.5 0.5 0.5 0.5
6(f)(i) (ii)	**Note:** In the question, CFF has been erroneously printed as CEE. Thus, the **two** marks of this question are to be awarded to all who have attempted 6(f).	2

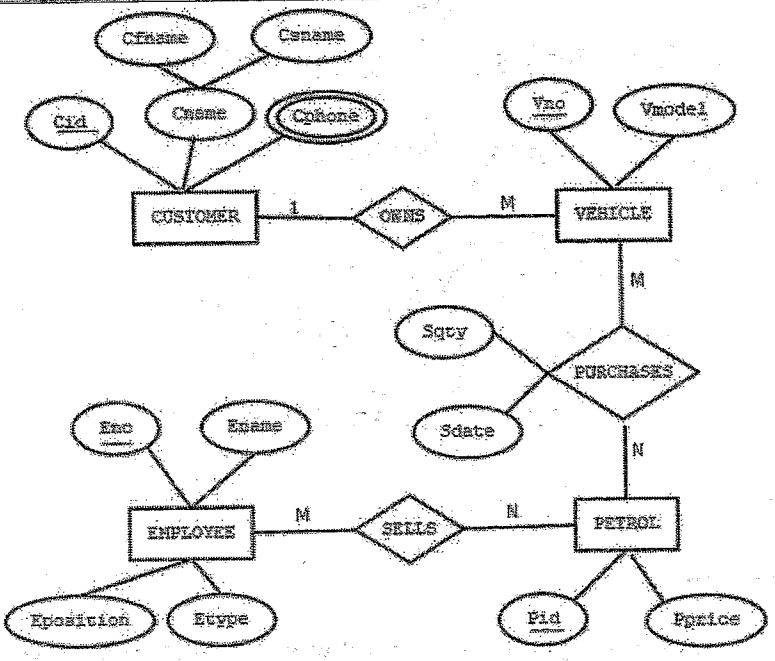
Qn	*Answer	Marks
7(a)(i)	Sensor used in this circuit is a Reed switch. It is sensitive to a magnetic field and acts as a switch accordingly. When the door is closed (applied with a magnetic field), the Reed switch acts as closed and when the door is open (without the magnetic field) the Reed switch acts as an open switch. Essential points – Identify the switch operation of (Reed switch) - (Switch on and off) due to the Magnetic Field application. **Marks allocation:** **A:** identifying the switch operation of the Reed switch **B:** switching on/off due to magnetic field	 **1** **1**
7(a)(ii)	**ANY TWO of the following corrections for a total mark of 2:** Correction 1: if (senState == LOW) Correction 2: tone(BuzzerP, 262); Correction 3: noTone(BuzzerP);	 **1** **1** **(1)**
7(a)(iii)	**Marks allocation:** **A:** LDR (or light sensor) **and** a Resistor (10KΩ) **B:** LDR (or light sensor) to be connected to A0 (or any Analog input pin of the Arduino board).	 **1** **1**
7(b)(i)	B2B, B2C, and C2B **Notes:** 1. No partial marks.	**1**

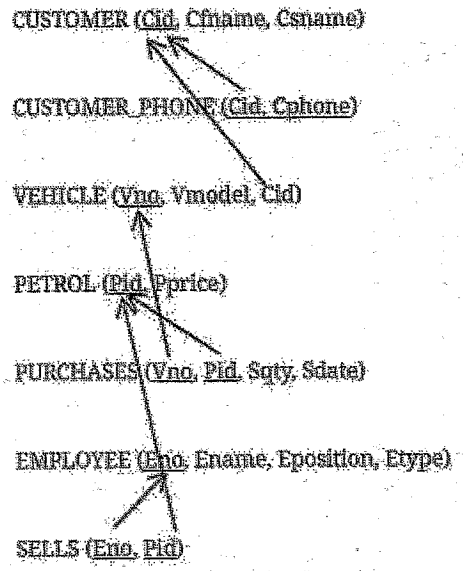
7(b)(ii)	**For** – SuperMobile can benefit financially by making the profits made by DeliverToday service to themselves and as the sales volumes grow there can be increasing gains. **Against** – **Any one of the following:** • initial setup cost (vehicles, salaries, fuel, insurance, etc.), • SuperMobile can experience cost overheads per each sale they make and the losses can be large to keep dedicated delivery service if the sales volumes drop. **Notes:** 1. Student must clearly relate the reason with financial relevance and justify	1 1
7(b)(iii)	**Any one of the following:** • Mobile Phones often have End of Life (EoL) and End of Support (EoS) defined by the manufacturer which marks the practical end dates for their sales • Mobile phone versions rapidly outdate with the technology and customer preferential features making them difficult to sell after a certain period • Certain internal parts (battery, etc) may not be safe to use after a certain period due to health and safety risks • Older models may no longer receive software updates, reducing their functionality over time.	1
7(b)(iv)	Allowing customers to give back their old phones for a discount when they purchase a new phone. **Marks allocation:** **A:** Collect old phones **B:** Discount for new purchase	 1 1

7(c)(i)	Agent programs demonstrate autonomous, proactive, reactive, cooperative, learnability and social-ability characteristics which standard software programs are usually not designed with. **Give the mark if the student has included any ONE of the following characteristics in his/her answer:** • autonomous • proactive • reactive • cooperative • learnability • social-ability / cooperation with other agents	1
7(c)(ii)	**Positive** – Generally, any consideration that when followed, will help to produce an optimum outcome of agent decisions. Allocate the mark to **any ONE** of the following: • avoiding collisions between agents and other objects • reducing power consumption • following shortest path • following least congested path **Negative** – Generally, any consideration that, when avoided, will help to produce an optimum outcome of agent decisions. Allocate the mark to **any ONE** of the following: • collisions • taking more time to deliver goods than the given time (or average time)	1 1

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>35

Notes:
1. No partial marks.</td><td>2</td></tr>
<tr><td>8(b)</td><td><table>
<tr><td>P</td><td>0</td></tr>
<tr><td>Q</td><td>int</td></tr>
<tr><td>R</td><td>str</td></tr>
<tr><td>S</td><td>n % 2</td></tr>
<tr><td>T</td><td>n // 2</td></tr>
<tr><td>U</td><td>reversed_binary</td></tr>
</table>
Notes:
1. Ignore space defects.
2. Exact spelling, case needed.</td><td>0.5
0.5
0.5
0.5
0.5
0.5</td></tr>
<tr><td>8(c)(i)</td><td><table>
<tr><td>A</td><td>n</td></tr>
<tr><td>B</td><td>weights</td></tr>
<tr><td>C</td><td>res</td></tr>
<tr><td>D</td><td>res</td></tr>
<tr><td>E</td><td>remainder</td></tr>
<tr><td>F</td><td>remainder</td></tr>
<tr><td>G</td><td>weight</td></tr>
<tr><td>H</td><td>item_selector</td></tr>
<tr><td>I</td><td>selected</td></tr>
</table>
Notes:
1. For B, either values or names is also acceptable.
2. Exact spelling, case needed.</td><td>1
1
1
1
1
1
1
1
1</td></tr>
<tr><td>8(c)(ii)</td><td>Any one of the following:
• Add two more items each to 'weights', 'values' and 'names arrays'
• Update the arrays to include the new item details
Notes:
1. If the answer is just 'update arrays', then only give 0.5 marks.</td><td>1</td></tr>
</table>

Qn #	Answer	Marks
9(a)(i)	 **Marks allocation:** **A:** Four entities with all attributes correctly listed, key attributes underlined (**0.5 marks** for each entity) **2** **B:** Three relationships with correct cardinality (**0.5 marks** for each relationship) **1.5** **C:** Two attributes of 'purchases' and 'Cphone' multi-valued attribute **0.5** **Notes:** 1. Ignore case defects. 2. Exact spelling needed.	

9(a)(ii)	 **Marks allocation:** **A:** Seven tables with all attributes correctly listed, primary key underlined (**0.5 marks** for each entity) **B:** Correctly drawn arrows **Notes:** 1. Ignore case defects. 2. Exact spelling needed.	**3.5** **0.5**
9(b)(i)	1NF / First normal form **Justification:** Result table has a number of partial dependencies and no repeating groups. Each field contains atomic values. **Marks allocation:** **A:** First normal form **B:** Justification	**1** **1**

Qn	Answer	Marks
10(a)	**second:** load value of variable 'width' into a register **third:** add the values in the two registers **Notes:** 1. Order important.	1 1
10(b)	**Mark allocation:** **A:** result of subtraction is 0010 **B:** 2's complement of 1100 is 0110 **C:** result of binary addition and ignoring the carry is 0010	 1 1 1
10(c)(i)	READY	1
10(c)(ii)	RUNNING -> BLOCKED	1
10(c)(iii)	The address of the next instruction to execute in the 'web browser' process is stored in the 'Program Counter' of the PCB of that process The address of the next instruction to execute in the 'spreadsheet' process is got from the 'Program Counter' of the PCB of that process **Mark allocation:** **A:** The address of the next instruction to execute in the 'web browser' process **B:** stored in the 'Program Counter' of the PCB of that process **C:** The address of the next instruction to execute in the "spreadsheet' process **D:** is got from the 'Program Counter' of the PCB of that process	 0.5 0.5 0.5 0.5
10(d)(i)	8	1
10(d)(ii)	110 0000 0000 0100	1