

4 New syllabus: Paper II

8327

AL/2020/20/E-II(NEW)

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

නව කීර්දමය/புதிய பாடத்திட்டம்/New Syllabus

NEW දෙවන වගුව අංක 1000/இரண்டாம் வகுப்பு எண் 1000
 இலங்கைப் பரீட்சைத் திணைக்களம், Sri Lanka Department of Examinations, Sri Lanka
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
 கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
 General Certificate of Education (Adv. Level) Examination, 2020

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

පැය තුනයි
 மூன்று மணித்தியாலம்
Three hours

අමතර කීර්දම කාලය - මිනිත්තු 10
 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

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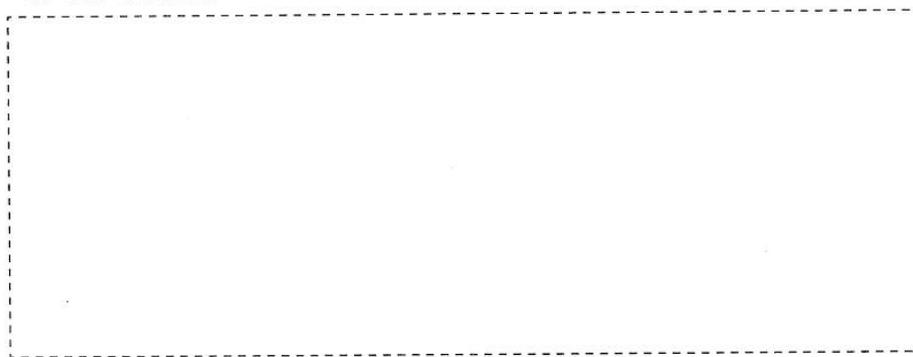
Part A – Structured Essay
Answer all four questions on this paper itself.

Do not write in this column

1. (a) Draw the expected output of the following code segment when rendered by a web browser.

```
<html>
<body>
<table border=1>
  <tr><th>No</th><th>Type</th><th>City</th></tr>
  <tr><td>1</td><td rowspan=2>High</td><td>Galle</td></tr>
  <tr><td>2</td><td>Jaffna</td></tr>
</table>
</body>
</html>
```

Note : Please consider the edges of the following dotted line box as the display area of web browser.



(b) Consider the following html code in which the lines are numbered to answer the questions in this part.

```
1. <html>
2. <head>
3.     <style type="text/css">
4.         h1,h2{color:blue;}
5.     </style>
6. </head>
7. <body>
8.     <h1 style="color:green;">Title One</h1>
9.     <h2>Title Two</h2>
10. </body>
11. </html>
```

(i) What are the colours of the text in line numbers 8 and 9 when the above code is rendered by the browser?

Line number	Text	Colour
8	Title One
9	Title Two

(ii) Write **one** advantage of defining styles as in line numbers 3, 4 and 5 over that of line number 8.

.....

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Index No.:

(iii) Write only the content of an **external style** sheet to include the following:

- a) the style defined in line number 8 and
- b) a CSS Id named 'appear' to define the style of the font as 'Arial'

.....

(c) The following **four** PHP code blocks which are labeled as A, B, C and D are taken from a code intended to retrieve data from a database to display on the screen. However, the code blocks are not in correct order.

Label	Code Block
A	<code>\$sql = "SELECT itemcode, name FROM Product"; \$result = \$conn->query(\$sql);</code>
B	<code>if (\$conn->connect_error) { die("Connection failed: " . \$conn->connect_error); }</code>
C	<code>if (\$result->num_rows > 0) { while(\$row = \$result->fetch_assoc()) { echo "Code:". \$row["itemcode"]."/Item:". \$row["name"]."
"; } } else { echo "0 results"; }</code>
D	<code>\$conn = new mysqli("localhost", "admin", "C#a8t", "StoreDB");</code>

(i) Write the labels of the four code blocks in the **correct order** inside the four blanks of the following PHP script.

```
<?php
.....
.....
.....
.....

$conn->close();
?>
```

(ii) If the above code blocks are in the correct order, what is the expected output if the 'Product' table has only the following values?

Product

itemcode	name
P1	Pen
P3	Book

.....

Do not write in this column



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2. (a) In an emergency health problem where people have to stay at home for a long period, the shops within the area remain closed for regular business activities. Under such circumstances the shops within a village or nearby town can help their community by practicing their business through e-commerce.
- Considering the above scenario, fill the blanks in the following statements with suitable phrases from the given list of phrases.
- (i) In this emergency situation, shops follow the business model.
 - (ii) Shops must use to allow customers to purchase more than one type of product in a single transaction.
 - (iii) The e-commerce site for each shop can implement to display their products to the customers.
 - (iv) For business owners who cannot use payment gateway through online fund receipts and for the customers who do not have any online mode of payments can still be supported through
 - (v) is one of the best ways to reduce the overhead costs of delivery within a local area such as a lane, street or housing scheme.
 - (vi) The local shop owners can establish to serve their community better by enabling access to each shop's services through a common portal.

List of phrases: {advertising banners, an online marketplace, a shopping cart, a web product catalogue, cash-on-delivery, credit-cards, discount pricing, group purchasing, payment gateways, click and brick, pure click, subscription as a revenue model}

(b) Consider the following Python program:

```
L1 = [int(x) for x in input().split()]
L2 = [int(x) for x in input().split()]
L3=[]
for i in L1:
    for j in L2:
        if (i==j) and (i not in L3):
            L3.append(i)

L3.sort()
print(L3)
```

(i) Write the output of the program if the first input (that creates L1) is "7 4 1 2 2 8" and the second input (that creates L2) is "8 2 4 5 6"?

.....

(ii) What is the purpose of this program?

.....

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3. (a) (i) State **two** service models in cloud computing.

(1)

(2)

(ii) What are the **three** steps in the FETCH-EXECUTION cycle of a computer?

(1)

(2)

(3)

(b) Match each of the given sentences (i) – (v) relating to computer networks with the most suitable item from the list below.

List = {ADSL Connection, DSL Connection, FTP, HTTP, Internet Layer, Malware, Phishing, TCP, Transport Layer, UDP}

(i) A simple and query based communication model with a minimum use of protocol mechanisms applied in transport layer

(ii) A protocol for data communication in the World Wide Web

(iii) The layer that defines the addressing and routing structures used for the TCP/IP protocol suite in the TCP/IP model

(iv) The process of attempting to get sensitive information from someone by pretending as a trustworthy person

(v) The connection that allows the data transmission at much greater speed and capacity than the narrowband services

Note: Write only the matching item against the phrase number.

(i)

(ii)

(iii)

(iv)

(v)

Do not write in this column



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4. (a) An operating system uses *Process Control Blocks (PCBs)* to maintain important information about each process.

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(i) Read the following scenario and answer the given question:

Piyal starts a spreadsheet program on a single processor computer to use the budget.xls file that he saved the day before. He also is running a web browser that he uses to check his email.

At a particular time, the operating system changes the **process state** field in the PCB of the **spreadsheet process** from “Running” to “Blocked”. Give **one** likely reason for that transition.

.....

(ii) When the state of a process changes (e.g., “Running” → “Ready”), the values of the machine registers are stored in the PCB of that process. Why is it important to store them?

.....

(b) The block size of a disk is 4 KB. A portion of its **File Allocation Table (FAT)** starting from block 300 at a particular time, is shown below. It gives the blocks of *maximum.py* file as well:

FAT

300	303
301	300
302	
303	304
304	-1

Note: The last block of a file is indicated by -1.

(i) Write down the value of an important number that will be stored in the **directory entry** for *maximum.py* file that will help an operating system locate the blocks in that file.

.....

(ii) Assume that additional improvements are made to the *maximum.py* file that results in its size becoming 20 KB. What changes are needed in the FAT for this purpose?

.....

(c) Assume that we have a computer that can use 16-bit virtual addresses from 0 up to 64 K.

Assume further that this computer has only 32 KB of physical memory and that the page size in this computer is 4 KB.

(i) The above 16-bit virtual address is made up of the *bits of the page number* followed by *offset bits*. How many bits in the address are required to store a page number in this computer?

.....

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(ii) User runs a particular program having a size of 32KB on this computer. A few selected fields of the *page table* of that process at a particular time are shown in the figure below.

Do not write in this column

Page number	Frame number	Present/absent
0	101	1
1	000	0
2	000	0
3	110	1
4	011	1
5	000	0
6	111	1
7	000	0

Notes:

- The frame number is indicated in *binary*.
- The virtual addresses on page 0 are from 0 to 4095 and on page 1 are from 4096 to 8191 and so on.
- The **Present/absent** bit indicates the validity of the entry. If this bit is 1, the entry is valid and can be used. If it is 0, then the relevant virtual page is not in physical memory.

Assume that in the above process the virtual address 0011 0000 0000 0010 is wanted.

The above virtual address is mapped to the physical address 110 0000 0000 0010. Explain it.

.....

.....

.....

.....

.....

.....

.....

.....

(iii) Assume that there was a request for the virtual address 0001 0000 0000 0000. Due to the set of tasks that the operating system initiated to fulfil that request, the present/absent bit of the page number 6 in the above page table changed from 1 to 0. What is the likely 15-bit physical address that the virtual address 0001 0000 0000 0000 will be mapped to?

.....

* *



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ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கை S. L. I. E. E. திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

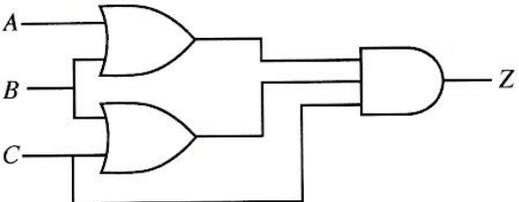
තොරතුරු හා සන්නිවේදන තාක්ෂණය II தகவல், தொடர்பாடல் தொழினுட்பவியல் II Information & Communication Technology II	<div style="border: 1px solid black; padding: 5px; display: inline-block;">20</div> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 0 5px;">E</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">II</div>
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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 Z is the output.



- (a) Give the complete truth table for the given circuit.
- (b) Using a Karnaugh map, derive a simplified sum-of-products (SOP) expression for the output Z.
- (c) Using a Karnaugh map, derive a simplified product-of-sums (POS) expression for the output Z.
- (d) Of the two expressions (SOP and POS) you obtained in (b) and (c) above, which one is better to implement a more simplified logic circuit than the given logic circuit above? Explain your answer.

6. Consider the following scenario:
 The PQR Company has three departments, namely *Finance*, *Marketing* and *Human Resource* (HR). At present all the activities of the PQR Company are conducted manually. The company decides to computerize all their activities by establishing an IT unit with a computer lab for staff training. Resources will be allocated for each department and the IT unit as follows.

Department	Resources		
	Computers	Printer type	Software Server
Finance	28	01 Network Printer	Accounting Information System (AIS)
HR	40	01 Network Printer	Human Resource Information System (HRIS)
IT Unit	50	01 Printer	Learning Management System (LMS)
Marketing	35	01 Network Printer	Marketing Information System (MKIS)

- The company proposes the following:
- A Local Area Network (LAN) for each Department and the IT unit in order to share specific software and resources
 - LANs in each department to be interconnected via IT unit
 - All computers to be given efficient Internet connectivity with the help of a DNS (Domain Name System) and proxy servers

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- An Internet Service Provider (ISP) to supply the Internet connectivity to the IT unit
- The entire network to be protected through a firewall

- (a) Which network topology is the most suitable to satisfy all the above mentioned requirements? Give **one** reason to justify your answer.
- (b) The Network Administrator has received 192.168.14.0/24 as the IP address block for the company. The IP addresses for the nodes are to be allocated after making four subnets from this address block for each department/unit.

The following incomplete table shows the sub-netting. Write down the missing IP addresses for each department/unit using the following table format. (Assume that subnetting is done under the consideration of future expansion of each department/unit.)

Department	Network ID	Broadcast ID	Subnet Mask	Usable IP Address Range
Finance	192.168.14.0	192.168.14.63	255.255.255.192	192.168.14.1–192.168.14.62
HR				
IT Unit				
Marketing				

- (c) Showing clearly the connection topology and the devices, draw the logical arrangement for the company network that the network administrator can implement to fulfill the company's requirements. (Assume that additional IP addresses can be obtained.)
- (d) Network administrator decides to dynamically manage the IP addresses of the entire network. Write down the mechanism that needs to be implemented to achieve this task.
7. (a) AB Stores is a grocery shop in your home town. With your expert advise, AB Stores has implemented a web-based e-commerce system to conduct their business online as well. Customers can select their required products and confirm the order online.
- (i) What is the e-commerce business type applicable in this scenario?
 - (ii) What is the revenue model used in this e-commerce offering of AB Stores?
 - (iii) The e-commerce solution of AB Stores became popular rapidly with a growing userbase. However, it was noticed that most of the regular customers from the local community still preferred using the physical outlet than the e-commerce offering. Identify **two** possible reasons for such preference.
 - (iv) AB Stores extended its e-commerce system to integrate with its suppliers' systems to maintain its product stocks through automation. What is the e-commerce business type AB Stores implements with this system modification?
 - (v) AB Stores decides to expand its e-commerce solution allowing other local shops to have virtual stores within the system. What is the term used to identify the proposed system?
 - (vi) Write down **one** advantage that **each** of the following will receive by having the proposed system in (v) above.
 - (1) Customers
 - (2) AB Stores
 - (3) other local shops

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(vii) A recent market survey has identified the following about the customers who have registered with the AB Stores e-commerce system proposed in (v) above:

- 98% are nearby residents within a 2 km radius.
- 12% of them are able to pay online (either through credit/debit cards or mobile cash options)
- 18% do not wish to pay in advance for a future transaction.

What is your suggestion to enable most of the registered customers to make purchases successfully through the system and receive their goods at home without any restriction? Explain your answer.

(viii) With the expected growth of the e-commerce business of AB Stores, you have advised them to outsource the delivery of customer purchased goods to a third-party delivery service. Explain **two** advantages AB Stores can get by doing so.

(b) Multi agent systems can be used to replace some of the work that require humans. The following scenario explains about **myTours** multi-agent system used to build customized travel packages including flight booking, hotel room reservation and taxi booking for local travel during the tour.

A prospective traveler (user) can access **myTours** website over the Internet and a chat-bot agent starts interacting with the user. User can use voice or text as the input medium. During this interaction chat-bot passes the extracted information to a search-agent who will take over from the chat-bot agent and proceed to search for travel packages for the user. The search-agent has a group of agents each specializing for particular type of travel service such as flight search, hotel search etc. Once the search results are obtained the search-agent prepares the list of travel packages with details and displays to the user for confirmation.

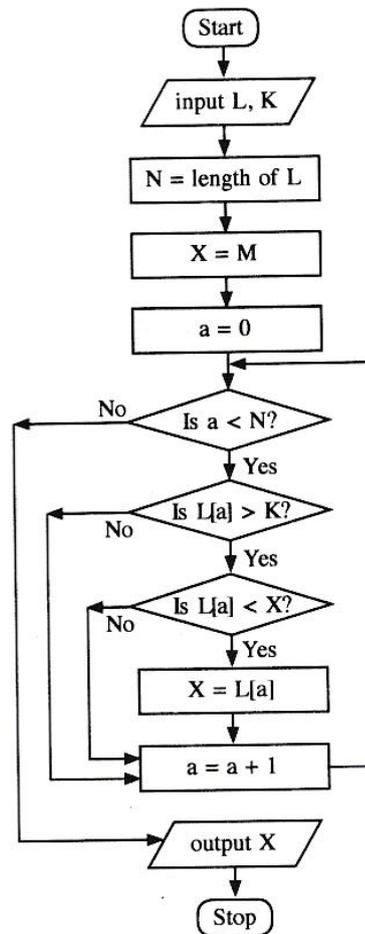
- (i) Draw a simplified agent diagram of the above explained multi-agent system. Name the important entities in your diagram.
- (ii) Which agent **cannot** be considered as self-autonomous?
- (iii) Write a **disadvantage** of using a multi-agent system for the given example user requirement.

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8. (a) You are given two positive integers N_1 and N_2 as inputs (assume $N_1 < N_2$) and you have to output the list of even numbers between N_1 and N_2 . Construct a flowchart or a pseudo code to express an algorithm for this purpose.
- (b) Consider the flowchart given below. Assume that L is a list of positive integers, K is a positive integer and every element in L is less than M , which is a large integer.



- (i) What would be the output if the first input L was 2, 4, 7, 9, 3, 5 and the next input K was 5?
- (ii) What is the purpose of this algorithm?
- (iii) Develop a Python program to implement the algorithm expressed by the flowchart.

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9. (a) Consider the following description relating to details of players attached to different sports clubs. A player always belongs to a sports club and he/she can be identified uniquely by the NIC (National Identity Card) number. Further a player has a name which consists of a surname and initials.

A club which is uniquely identified by its name can have many players. A player can play games. Each game in this context is given a unique code and a description. A player can play more than one game and each game is played by at least one player.

Note : Use only the relevant words in the above description when drawing the Entity-Relationship (E-R) diagrams for the following questions.

- (i) Draw an ER diagram for the above description.
- (ii) Extend the ER diagram in above (i) to include the number of hours played by each player for each game.
- (iii) Player may have a sponsor who has a unique title. A sponsor can give sponsorship only for one player. Extend further the ER diagram in part (ii) above to include the sponsor's details.

- (b) The 'Winner' table given below contains the details of the players who won different matches and medals. There is a fixed amount of prize money given to each medal type. A Gold medal has Rs. 20,000/=, a Silver medal has Rs. 10,000/= and a Bronze medal has Rs. 5,000/=.

Consider the primary key of the Winner table as NIC and MatchID.

Winner Table

NIC	MatchID	MedalType	Prize
951477751V	BD-2	Silver	10000
985467923V	BD-2	Gold	20000
995874159V	BD-1	Gold	20000
997656614V	BD-3	Silver	10000
951477751V	BD-1	Bronze	5000

- (i) Write an SQL statement to display the number of players who won "Gold" medals.
 - (ii) In which normal form does the above table exist? Justify your answer.
 - (iii) Convert the above table to the next normal form. (It is **not required** to write the data in the tables derived in next normal form.)
10. (a) The 3-stage procedure for handing over a letter for registered post to a post office is as follows:
- **Determining Postage**
The customer hands over the letter to the **Registration Counter**. The letter is weighed and the postage for the relevant weight is read from a table. The postage is written on the letter by the counter and it is given to the customer.
 - **Issuing Stamps**
The customer hands over the letter with the postage written on it to the **Stamps Counter** with the amount of postage. Stamps for the postage and the letter are issued to the customer with any balance due by the **Stamps Counter**.
 - **Registering Letter**
The customer sticks the stamps on the letter and hands it over to the **Registration Counter**. The **Registration Counter** accepts the letter, sticks the 'Registered Post' label with a unique identification code to the letter, keeps the letter and issues a receipt with sender and recipient information with the date and the amount paid, to the customer.

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Using standard symbols, draw the following:

- (i) Context Diagram
- (ii) Level 1 Data Flow Diagram (DFD)

(b) Your school plans to use an online system to provide extended learner support to A/L and O/L students during school holidays, weekends and other times that the school is not open. It is decided to use a suitable Commercial-Off-The-Shelf (COTS) software system for this need. Your team has been requested to help with this project.

(i) Some of your project team members argue that since COTS software are to be used there is no need of requirement analysis. List **three** most significant reasons to explain why you must complete requirement analysis even in this project. **Note:** Your answer must be specific to a project with COTS software use. Generic answers will not be accepted.

(ii) Following are part of the requirements identified for the above project. Identify and write down the labels (A–G) of all the *functional requirement* statements within the list.

(A) Teaching material and learning content upload to the system shall only be allowed to the teachers assigned to that particular learning session.

(B) The system shall be available for user access at least 99.9% of the time.

(C) The access history for each student's learning activity participation or content use within a course must be maintained as a report to be accessed by the subject teacher.

(D) The system should be easy to work with after 1 hour of training.

(E) At the end of each learning session, the students must be provided with an option to ask questions from the teacher.

(F) The system should respond to any user request within 2000ms.

(G) The system should be able to serve a minimum of 200 concurrent users at a given time.

(iii) What is the most appropriate testing strategy for your team to evaluate the selected COTS software system for the identified requirements?

* * *