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

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නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் 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 I
தகவல், தொடர்பாடல் தொழினுட்பவியல் I
Information & Communication Technology I

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පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

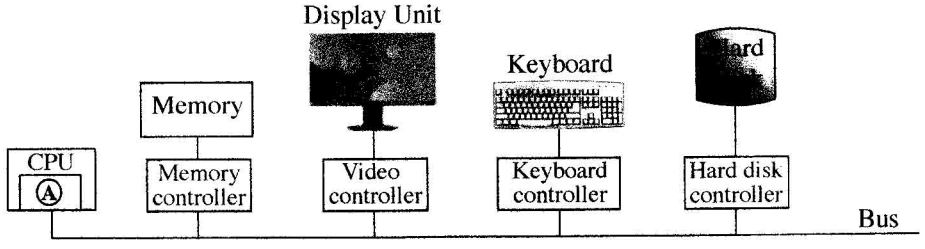
- *Answer **all** the questions.*
- *Write your **Index Number** in the space provided in the answer sheet.*
- *Instructions are also given on the back of the answer sheet. Follow those carefully.*
- *In each of the questions **1** to **50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct or most appropriate** and **mark your response on the answer sheet with a cross** (×) **in accordance with the instructions given on the back of the answer sheet.***
- *Use of calculators is **not allowed**.*

1. A computer processor will operate fastest when the data that it wants is in the
(1) cache memory. (2) hard disk. (3) magnetic tape.
(4) main memory. (5) optical disk.

2. Which of the following hardware components will lose data when the power to a computer is switched off?
A – registers
B – cache memory
C – main memory
(1) A only (2) A and B only (3) A and C only
(4) B and C only (5) All A, B and C

3. Computer has evolved from the early main frames to the relatively small smart devices with high computing power used today. Which of the following inventions contributed to reduce the physical size of computers?
(1) bus (2) integrated circuits (3) registers
(4) solid state memory (5) vacuum tube

4. Consider the following diagram showing some hardware component connections on a computer system:



The **hardware** part within the CPU indicated by Ⓐ in the above diagram has a set of registers that has the memory translation maps of the currently running process. When given an input *virtual address* of the current process it outputs the relevant *physical address* (if any).

The Ⓐ in the above diagram denotes the
(1) arithmetic and logic unit (ALU). (2) control unit. (3) L1 cache memory.
(4) memory management unit. (5) page table.

[See page two

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5. Consider the two binary numbers P = 10110001 and Q = 01001110. If $X = P$ OR Q and $Y = P$ AND Q, what will be the values of X and Y respectively?

(1) 01001110, 10110001
(2) 10110001, 00000000
(3) 10110001, 11111111
(4) 11111111, 00000000
(5) 11111111, 10110001

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6. What is the 2's complement of decimal –12?

(1) 00001100 (2) 00110011 (3) 11110011 (4) 11110100 (5) 11111011

7. Which of the following is true about 2's complement?

(1) An extra bit is used to represent the sign.
(2) Makes it possible to build low-cost, high-speed hardware to perform arithmetic operations.
(3) Addition and subtraction are used as two different operations.
(4) Usually represented in hexadecimal number system.
(5) Used in first generation computers to perform logic operations.

8. Consider the character representations in Table 1 and Table 2 given below:

Table 1:

ඒ	ඓ	ඔ	ඕ
0D85	0D86	0D87	0D88

Table 2:

அ	ஆ	இ	ஈ
0B85	0B86	0B87	0B88

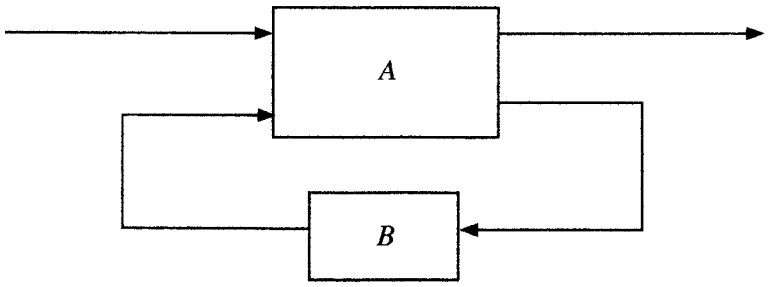
In which of the character encoding systems given below, the above characters in Table 1 and Table 2 are represented?

(1) Both Tables 1 and 2 : in ASCII
(2) Both Tables 1 and 2 : in UNICODE
(3) Table 1: in ASCII, Table 2: in UNICODE
(4) Table 1: in EBCDIC, Table 2: in ASCII
(5) Table 1: in UNICODE, Table 2: in ASCII

9. Which of the following is the most simplified expression equivalent to $A\bar{B}\bar{C} + B\bar{C} + \bar{A}\bar{B}C + BC$?

(1) $A\bar{B}\bar{C} + \bar{A}\bar{B}C + B$ (2) $\bar{B}(A\bar{C} + \bar{A}C) + B$
(3) $\bar{C}(A\bar{B} + B) + C(\bar{A}\bar{B} + B)$ (4) $A\bar{C} + \bar{A}C + B$
(5) $\bar{A}\bar{C} + B$

10. A block diagram of a sequential logic circuit is shown below, with one block labelled as "A" and the other labelled as "B".



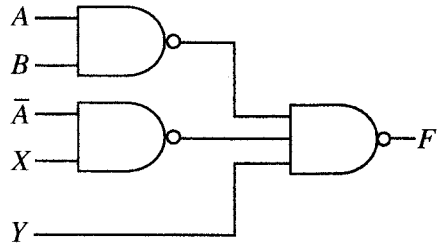
Which of the following statements about the above block diagram are correct?

I – The block A is a combinational logic circuit.
II – The block B is a memory element.
III – Only the block A can be implemented using logic gates.

(1) Only I (2) Only II (3) Only I and II
(4) Only I and III (5) All I, II and III

[See page three

11. Consider the following logic circuit consisting of NAND gates:



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If the required output of the above circuit is $AB+\overline{A}\overline{B}+\overline{C}$, then what should the inputs X and Y be?

(1) $X = B$ and $Y = C$ (2) $X = B$ and $Y = \overline{C}$ (3) $X = \overline{B}$ and $Y = C$
(4) $X = \overline{B}$ and $Y = \overline{C}$ (5) $X = \overline{C}$ and $Y = B$

12. The *operating system* (OS) is another program that runs on the computer that has some special responsibilities. Memory management, file management and input/output management are some of these responsibilities. What is another important responsibility of the OS?

(1) backup management (2) cache memory management
(3) compiler management (4) process management
(5) system clock management

13. When the number of *processes* started by a user on a single-processor computer increases, what happens to the response time of each process as perceived by the user and the memory management related work of the operating system respectively?

(1) Both the response time and the memory management related work increase.
(2) Response time decreases while the memory management related work increases.
(3) Response time increases while the memory management related work decreases.
(4) Both the response time and the memory management related work decrease.
(5) There is no change in either of them.

14. Which of the following is **not** a responsibility of the *operating system*?

(1) allocating physical memory to processes
(2) deciding which process to run
(3) keeping track of the usage of compiled program files on a hard disk
(4) keeping track of which parts of physical memory are in use, which are free
(5) swapping processes between physical memory and disk

15. In a computer, the size of a user program could exceed the size of physical memory. Also, only the demanded areas of programs are kept in physical memory.

The above are due to which of the following?

(1) the use of cache memory
(2) the use of contiguous file allocation
(3) the use of a file allocation table (FAT)
(4) the use of memory management unit (MMU)
(5) the use of *pages*, *frames* and *page tables*

16. Which of the following statements regarding *compilers* and *interpreters* are correct?

A – A compiler transforms an entire high-level language program into its machine code.
B – An interpreter converts each high-level program statement into the relevant machine code during the program run.
C – Compiled codes usually run faster than interpreted codes.

(1) A only (2) A and B only
(3) A and C only (4) B and C only
(5) All A, B and C

[See page four

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17. Which of the following statements regarding *guided* and *unguided* media are correct?

A – Guided media transmission supports higher data speeds than unguided media transmission.
B – Guided media is subjected to less interference than unguided media.
C – Unguided media transmission is more secure than guided media transmission.
D – Unguided media transmission uses low bandwidth than guided media transmission.

(1) A, B and C only
(2) A, B and D only
(3) A, C and D only
(4) B, C and D only
(5) All A, B, C and D

18. What is the process carried-out in the *modulation* technique in data transmission?

(1) encoding information in transmitted signal
(2) encoding signals in transmitted information
(3) extracting information from the transmitted signal
(4) extracting signal from the transmitted information
(5) transfer information with minimum distortion

19. Which of the following statements about *bus topology* are **incorrect**?

A – Computers and network devices are connected to a single cable.
B – All traffic flows are either clockwise or anticlockwise.
C – Bandwidth is shared among the nodes.
D – Each node is connected to two of its neighbours.

(1) A and B only
(2) A and D only
(3) B and C only
(4) B and D only
(5) C and D only

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20. Consider the following statement with a blank.
A Media Access Control (MAC) address is usually represented in ..... numbers.
Which of the following is suitable to fill the blank?

(1) binary (2) decimal (3) hexadecimal (4) natural (5) octal

21. You are requested to create 16 subnets with a Class C IP. Which subnet mask is suited to create the subnet?

(1) 255.255.255.240
(2) 255.255.255.248
(3) 255.255.255.250
(4) 255.255.255.252
(5) 255.255.255.224

22. Which of the following statement/s regarding the *testing* of a system are correct?

A – Black-box testing involves detailed checking of each line in the code.
B – Unit-testing helps to uncover errors in the codes.
C – System testing should not be performed prior to unit-testing.

(1) A only
(2) B only
(3) C only
(4) A and C only
(5) B and C only

23. Which of the following indicate *functional requirements*?

A – The users should be allowed to update their contact addresses and phone numbers.
B – Any user request must be responded within 2 ms.
C – The system must be easy to change.

(1) A only
(2) B only
(3) C only
(4) A and C only
(5) All A, B and C

[See page five

24. The following details are given about a software project:

A – requirements are fixed (not allowed to change throughout the complete project)
B – must deliver the complete software product at once
C – detailed descriptions and specifications must be prepared for each activity within the project

What is the most suitable software process model for this project?

(1) Agile
(2) Prototype
(3) Rapid Application Development
(4) Spiral
(5) Waterfall

25. Which of the following statements on Data Flow Diagrams (DFD) is **incorrect**?

(1) Context diagram is a DFD with the highest level of abstraction.
(2) All data stores in a system must be represented in the context diagram.
(3) Data flows are used to link the other components in DFDs.
(4) Elementary processes are not decomposed further.
(5) External entities in DFDs act as sources or recipients of data.

26. What is the correct SQL statement to delete a database called 'ALdb'?

(1) delete ALdb;
(2) delete database ALdb;
(3) drop ALdb;
(4) drop database ALdb;
(5) remove database ALdb;

27. Which of the following statement/s about a relation in the Second Normal Form (2NF) are true?

A – It can have a composite key.
B – It should be in the First Normal Form (1NF) as well.
C – All non-key attributes are fully functionally dependent on the primary key.

(1) B only
(2) C only
(3) A and B only
(4) B and C only
(5) All A, B and C

28. Which of the following statement/s regarding the *logical database schema* are true?

A – It is a blueprint for a database.
B – It contains data and information.
C – It formulates all the constraints that are to be applied on the data.

(1) A only
(2) A and B only
(3) A and C only
(4) B and C only
(5) All A, B and C

29. Consider the following SQL statement:

Alter table subject add primary key (Subject_Id);

Which of the following is **incorrect** about the above SQL statement?

(1) It adds a primary key constraint to the table named *subject*.
(2) The table named *subject* should already exist.
(3) The field *Subject_Id* should not be null.
(4) A table named *subject* is created with a primary key named *Subject_Id*.
(5) The values of the field *Subject_Id* should not be repeated in *subject* table.

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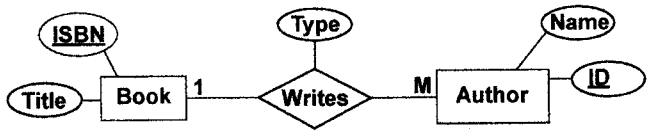
[See page six

- Consider the following scenario about 'authors' and 'books' to answer the questions **30** and **31**.

"An author can write books. A book has a title and a code called ISBN which is unique. A book can be written by either one or several authors. An author has a name and a unique ID. An author can have a type as either chief author or a co-author for a particular book."

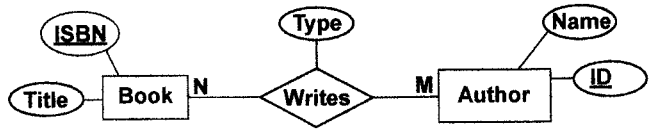
30. Which of the following is the most suitable Entity Relationship (ER) representation for the above scenario?

(1)

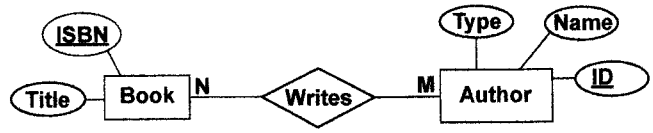


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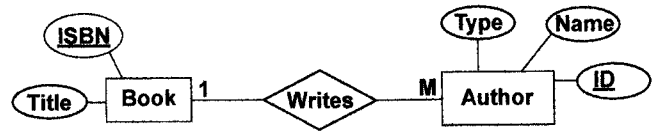
(2)



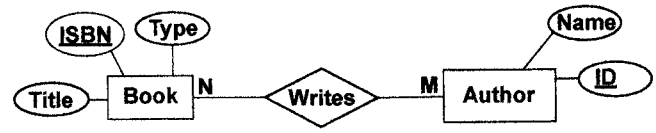
(3)



(4)



(5)



31. How many tables can be derived initially, when mapping the entity relationships in the above scenario to a relational schema?

(1) 1 (2) 2 (3) 3 (4) 4 (5) 5

[See page seven

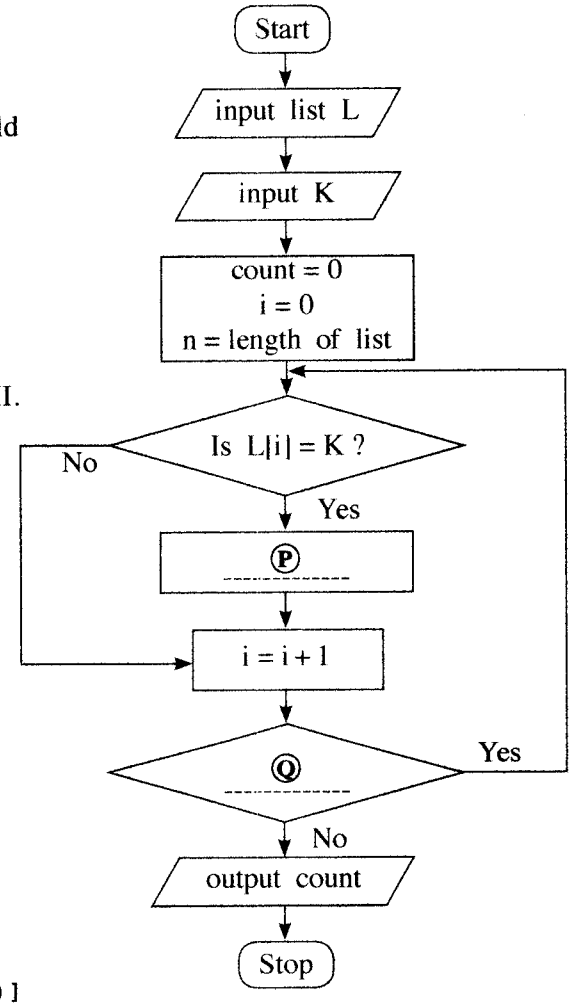
- The questions **32 – 34** are based on the algorithm expressed by the flowchart below. The algorithm takes a list L of items and an item K as inputs and is expected to output the number of items in L that are equal to K. List indices start at 0. Note that two entries, labelled as Ⓟ and Ⓠ, in the flowchart are blank (unspecified).

32. For the algorithm to function correctly, what should be inserted at the blank Ⓟ?

(1) n = n-1
(2) n = n+1
(3) count = count + 1
(4) count = count + i
(5) count = count + n

33. For the algorithm to function correctly, what should be inserted at the blank Ⓠ ?

(1) Is i < n?
(2) Is i = n?
(3) Is count < n?
(4) Is count < K?
(5) Is n > 0?



34. Consider the following python programs I, II and III.

I
```
L = [int(x) for x in input().split()]
K = int(input())
count = 0
for i in range(len(L)):
      if (L[i]== K):
            count = count + 1
print(count)
```

II
```
L = input().split()
K = input()
count = 0
n = len(L)
for i in range(n):
      if (L[i]== K):
            count = count + i
print(count)
```

III
```
L = [int(x) for x in input().split()]
K = int(input())
count = i = 0
while ( i < len(L)):
      if (L[i]== K):
            count = count + 1
print(count)
```

Which of the above python programs implement the given algorithm?

(1) Only I (2) Only II (3) Only I and II
(4) Only I and III (5) All I, II and III

[See page eight

35. What would be the output of the following Python code, if the input was 17?

```
n = float(input())
m = (n // (n % 5)) ** 3
print(m)
```

(1) 24.0 (2) 25.5 (3) 512.0 (4) 614.125 (5) an error message

36. Suppose that S is a string, L is a list and T is a tuple in a Python program. The length of each is 10. Consider the following Python statements:

I S[2] = '2'
II L[2] = '2'
III T[2] = '2'

Which of the above three statements will generate an error?

(1) Only I (2) Only II (3) Only I and II
(4) Only I and III (5) All I, II and III

37. What would be the output of the following Python code segment?

```
S = "corona virus pandemic"
V = "aeiou"
count = 0
for i in range(len(S)):
        if (S[i] in V):
                count = count + 1
print(count)
```

(1) 0 (2) 5 (3) 8 (4) 19 (5) 21

38. What would be the output when the following Python code is executed?

```
x = 1
def myfunc(p, q):
    global x
    p, q = q, p
    x = x + p
myfunc(x,3)
print(x)
```

(1) 1 (2) 2 (3) 3 (4) 4 (5) an error message

39. What would be the output of the following Python code, if the input was 100?

```
n = int(input())
if (n > 0):
    m = "Z"
    if (n > 10):
        if (n > 100):
            m = "A"
        elif (n < 50):
            m = "B"
        else:
            m = "C"
    else:
        m = "D"
print(m)
```

(1) A (2) B (3) C (4) D (5) Z

[See page nine

40. What would be the output of the following Python code?

```
x = 1
y = 100
while (x < 100):
      y = y - x
      x = x + 1
      if (x + y) < 90:
            break
print(y)
```

(1) 100 (2) 85 (3) 79 (4) 72 (5) 7

41. Consider the following Python program:

```
f1 = open("inFile.txt", "r")
f2 = open("outFile.txt", "w")
checkString = "No"
for line in f1:
      if (checkString not in line):
          f2.write(line)
f1.close()
f2.close()
```

Which of the following statements are correct about the above program?

A – The content of the input file (inFile.txt) is checked in a loop, one line at a time.
B – The total content of one file is written onto another file.
C – If either of the two files does not exist, the program will stop and exit while executing the first two lines of the code.

(1) Only A (2) Only B (3) Only A and B
(4) Only A and C (5) All A, B and C

42. Which of the following HTML tags are used to define a *definition* list?

(1) <dl>, <dd>, <li> (2) <dl>, <dt>, <dd> (3) <dl>, <td>, <dd>
(4) <dl>, <th>, <dd> (5) <dl>, <th>, <td>

43. Which HTML tag is used to include a caption for a *fieldset* grouping in a form?

(1) <caption> (2) <head> (3) <label> (4) <legend> (5) <title>

44. What is the expected output of the following PHP code block?

```
<?php
      $one = "Welcome";
      $two = "2020";
echo $one.$two ;
?>
```

(1) Welcome.2020 (2) Welcome2020 (3) Welcome 2020
(4) Welcome;2020; (5) Welcome.2020;

45. Which of the following affects **least** to the downloading speed of a web page?

(1) capability of the web browser
(2) number of hyperlinks in the web page
(3) number and size of images in the web page
(4) processing power of the server computer that stores the web page
(5) the bandwidth of the internet connection which is used to access the web page

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[See page ten

46. Which of the following statements is true about the code given below?

```
<style>
        .title {
        text-align: center;
        color: blue;
        }
</style>
```

(1) This defines internal styles and uses the CSS 'class' concept.
(2) This defines internal styles and uses the CSS 'group' concept.
(3) This defines inline styles and uses the CSS 'group' concept.
(4) The styles defined inside the code can be used only for one type of element.
(5) This is an example of the CSS 'Id' concept and the name of the Id is 'title'.

47. Consider the following HTML code line:

```
<a href="#PartA"> Go to Part A </a>
```

Which of the rows in the following table describes the outcome of the above code line?

	Displayed as a hyperlink	**To which the hyperlink connects to**
(1)	#PartA	new web page named "Go to Part A"
(2)	#PartA	part of the same page named with Id "Go to Part A"
(3)	Go to Part A	new web page named "#PartA"
(4)	Go to Part A	part of the same web page named with Id "#PartA"
(5)	Go to Part A	part of the same web page named with Id "PartA"

48. Which of the following statements related to *e-commerce* are true?

A – A particular product may be available at different prices at different e-commerce sites.
B – Payment option at the receipt of goods allows customers to verify the quality of their purchases made through the e-commerce site.
C – Additional charges can be included as delivery and service fees over and above the stated price.

(1) A only (2) B only (3) C only
(4) A and C only (5) All A, B and C

49. Consider the following:

A – Cloud formation in the sky
B – The evolution of living species
C – How neurons function in the human brain

Which of the above could be used in *bio-inspired computing*?

(1) A only (2) B only (3) C only
(4) A and C only (5) B and C only

50. Which of the following statements about *quantum computing* are correct?

A – In quantum computing, principles of quantum physics are applied.
B – Quantum bits (qubits) are used in quantum computing as the information unit.
C – Quantum computers emit radiation fatal to human users.

(1) A only (2) B only (3) C only
(4) A and B only (5) All A, B and C

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නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW
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இலங்கைப் பரீட்சைத் 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**	**20**	**E** **II**

පැය තුනයි மூன்று மணித்தியாலம் ***Three hours***	අමතර කියවීම් කාලය - මිනිත්තු 10 යි 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

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.

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```
<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.

.....

.....

[see page three

Do not write in this column

(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	`$sql = "SELECT itemcode, name FROM Product";` `$result = $conn->query($sql);`

B	`if ($conn->connect_error) {`
	`  die("Connection failed: " . $conn->connect_error);`
	`}`

C	`if ($result->num_rows > 0) {` `  while($row = $result->fetch_assoc()) {` `  echo "Code:".$row["itemcode"]."/Item:".$row["name"]." ";` `  }` `} else {` `  echo "0 results";` `}`
D	`$conn = new mysqli("localhost", "admin", "C#a8t", "StoreDB");`

(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();
?>
```

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(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

.....

.....

[see page four

Do not write in this column

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?

.....

.....

[see page five

Do not write in this column

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) .....

[see page six

Do not write in this column

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

(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?

.....

[see page seven

Do not write in this column

(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.

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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[see page eight

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නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

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இலங்கைப் பரீட்சைத் 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

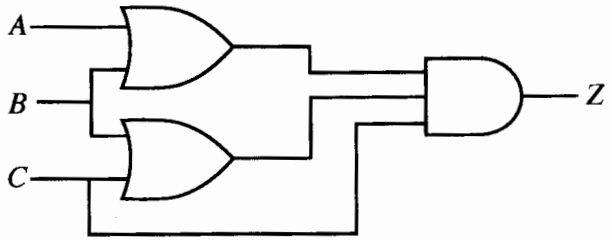
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தகவல், தொடர்பாடல் தொழினுட்பவியல் II
Information & Communication Technology II

20 E II

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

[see page ten

(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?

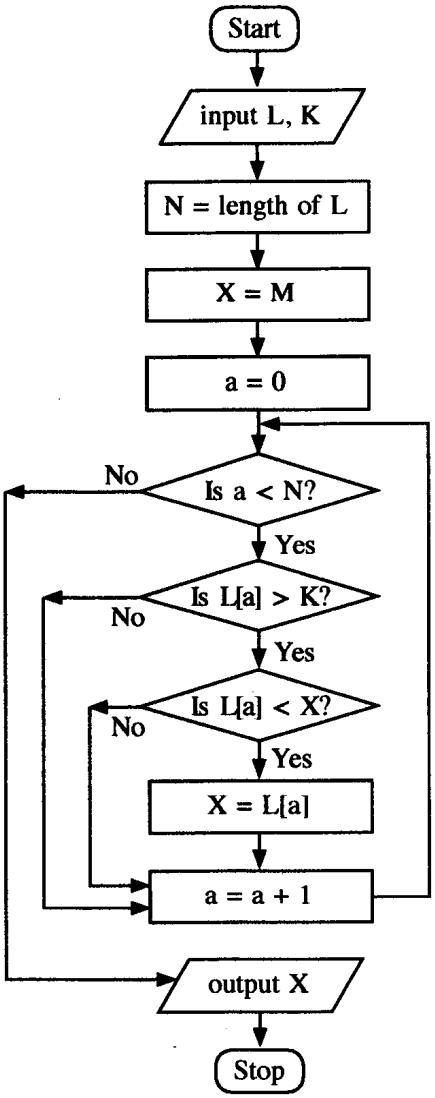
(iii) Write a **disadvantage** of using a multi-agent system for the given example user requirement.

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[see page eleven

8. (a) You are given two positive integers N1 and N2 as inputs (assume N1 < N2) and you have to output the list of even numbers between N1 and N2. 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.

[see page thirteen

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?

* * *