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

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2015 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2015 ஓகஸ்ற்று
General Certificate of Education (Adv. Level) Examination, August 2015

තොරතුරු හා සන්නිවේදන තාක්ෂණය I தகவல், தொடர்பாடல் தொழினுட்பவியல் I **Information & Communication Technology I**	**20 E I**	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 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. Charles Babbage is considered as the "father of the computer" by some people. That is because he
   (1) invented the mechanical calculator Pascaline.
   (2) invented the first re-programmable electronic computing machine.
   (3) took the leadership in building the first personal computer at IBM.
   (4) introduced the concept of "Input Process and Output" that is used in modern computers for the first time.
   (5) is the founder of the first electronic digital computer ENIAC (Electronic Numerical Integrator And Computer).

2. The first generation computers were based on
   (1) Very Large Scale Integration (VLSI) technology.
   (2) Large Scale Integration (LSI) technology.
   (3) Integrated Circuits (ICs).
   (4) Transistors.
   (5) Vacuum tubes

3. The decimal number equivalent to 110110_2 is
   (1) 39. (2) 48. (3) 54. (4) 55. (5) 108.

4. Consider the following list rendered by a web browser:
   1. Pineapple
   2. Mango
   3. Banana

   Which of the following HTML tags can be used to create the above list?
   (1) <dd> (2) <dl> (3) (4) (5)

5. Random Access Memory (RAM) modules are often compared by their capacity, measured in ..... and by their speed, measured in ..... .
   Most suitable words to fill the blanks of the above statements are respectively
   (1) Kilobytes, Gigabytes
   (2) Gigabytes, Megabits per second
   (3) Gigabytes, Megahertz
   (4) Megahertz, Kilohertz
   (5) Gigabits, Megabits per second

6. An application which requires more memory space than the maximum memory space available in the primary memory of a computer is ready for execution. Which of the followings is used by the operating system of that computer to satisfy this need?
   (1) Random Access Memory (RAM)
   (2) Read Only Memory (ROM)
   (3) Cache Memory
   (4) Virtual Memory
   (5) Extended Memory

7. $48B_{16} + 00101011_2 =$
   (1) $4B6_{16}$ (2) 310_{16} (3) 503_{16} (4) 513_{16} (5) 559_{16}

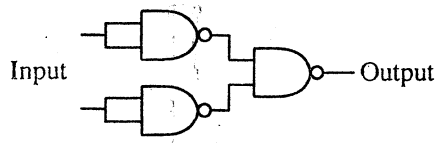
[See page two

8. The feature in modern operating systems which allows the automatic installation of new hardware devices connected to a computer is commonly known as
(1) Add/Remove Hardware. (2) Easy Installer. (3) Plug and Play
(4) Add Hardware Utility. (5) Fetch and Store.

9. Which of the following is **not** a typical use of the Random Access Memory(RAM) of a personal computer?
(1) Keeping data for processing.
(2) Holding instructions for operations.
(3) Providing storage for operating system
(4) Retaining information for output.
(5) Keeping the BIOS program for boot-up.

10. Consider the following statements about social networking sites:
A - They are being used increasingly as a medium for election campaigns.
B - A user's true identity is always guaranteed in a social networking site.
C - They are absolutely necessary to maintain human relationships in the modern society.
Which of the above statement(s) is/are correct?
(1) A only (2) B only (3) C only (4) A and B only (5) A and C only

11. Consider the following combinatory circuit implemented using universal gates:



The above circuit is equivalent to a/an
(1) AND Gate (2) OR Gate. (3) NAND Gate. (4) NOR Gate. (5) NOT Gate.

12. ..... is used for analog signal to digital signal conversion.
Which of the following is most appropriate to fill the blank in the above statement?
(1) Amplitude Modulation (AM) (2) Frequency Modulation (FM)
(3) Pulse Code Modulation (PCM) (4) Phase Modulation (PM)
(5) Time Division Modulation (TDM)

13. A computer in a network is configured with the IP address 192.248.16.91 and the subnet mask 255.255.255.128. Which of the following IP addresses **cannot** be assigned to a computer in the same network?
(1) 192.248.16.161 (2) 192.248.16.78 (3) 192.248.16.110
(4) 192.148.16.75 (5) 192.248.16.120

14. Some provinces in Sri Lanka currently issue revenue licenses for motor vehicles online. Which of the following is the correct business type for this service?
(1) B2C (2) B2B (3) C2B (4) B2E (5) G2C

15. Consider the following HTML element:
<input type = "text" name = "firstname" maxlength = "15" />
What is the effect of the attribute 'maxlength' on the functionality of the element above?
(1) It sets the length of the textbox to 15 pixels.
(2) It sets the length of the textbox to 15 characters.
(3) It displays maximum of 15 characters in the textbox.
(4) The display scrolls to the right after typing 15 characters.
(5) It allows to type maximum of 15 characters into the textbox.

16. Consider the following HTML element:
 Attributes
The value of the attribute 'target' in the above specifies that the linked document 'attributes.html' should be opened in
(1) a new tab or window (2) the same frame. (3) the parent frame.
(4) the frame named "blank". (5) the full body of the current window.

[See page three

17. What is the correct CSS rule to set the background colour of a web page to yellow?
(1) body {body-color: "yellow";} (2) body {bgcolor: yellow;}
(3) body {background-color: yellow;} (4) body {bgcolor = yellow}
(5) body {background-color = yellow;}

18. Which of the following statements is correct with respect to the Transmission Control Protocol (TCP)?
(1) TCP is a network layer protocol.
(2) TCP guarantees that each byte sent is received at the receiver.
(3) Only one application at a time can use TCP in a computer.
(4) HTTP uses TCP.
(5) TCP uses User Datagram Protocol (UDP) as the transport protocol.

19. A LAN uses the subnet mask 255.255.240.0. How many different IP addresses can be assigned to devices in this LAN?
(1) 254 (2) 256 (3) 1024 (4) 2046 (5) 4094

20. Which of the following statements is correct with respect to routing in the Internet?
(1) There can be at most one router in any given LAN.
(2) A router can have more than one network interface.
(3) Routing is a functionality of the Transport Layer.
(4) All routers function as HTTP proxies.
(5) The Internet does not need routing if all applications use TCP.

21. Consider the following terms related to computer systems:
A - Malware B - Hardware C - Software D - Liveware
Which of the above are basic components of a computer system?
(1) A and B only (2) A and C only (3) A and D only
(4) B and C only (5) B, C and D only

22. In a public key encryption system, the private key of a person x is given by the function priv(x) and the public key is given by pub(x). Consider the following statements:
A - pub(x) is used to encrypt a message that can only be decrypted using priv(x).
B - pub(x) is used to sign a message to be sent to x.
C - A message encrypted using pub(x) can be decrypted using pub(x).
Which of the above statement(s) is/are correct?
(1) A only (2) B only (3) C only (4) A and B only (5) B and C only

23 Consider the following statements regarding a server with the domain name www.bogus.lk:
A - The server www.bogus.lk can be located anywhere in the world.
B - www.bogus.lk must be a web server.
C - The domain names www.bogus.lk and www.bogus.com can be resolved to the same IP address.
Which of the above statement(s) is/are correct?
(1) A only (2) B only (3) C only (4) A and B only (5) A and C only

24. Consider the following statements about computer programming languages:
A - The processor of a typical computer can understand and execute only the machine language of that processor.
B - The processor of a typical computer can understand and execute any machine language of any processor.
C - The processor of a typical computer can understand and execute any program in any assembly language.
D - The processor of a typical computer can understand and execute any program in Python language.
Which of the above statement(s) is/are correct?
(1) A only (2) A and B only (3) A and C only (4) B and C only (5) C and D only

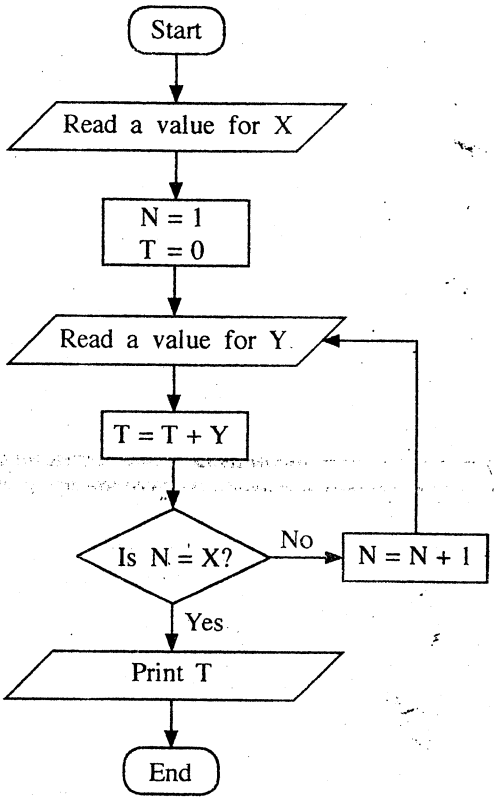
[See page four

25. Consider the following statements about the World Wide Web (WWW):
A - It is a collection of interlinked, hypertext documents accessed via the Internet.
B - It is a protocol for distributing information via computers connected to the Internet.
C - It was invented by the World Wide Web Consortium (W3C).
Which of the above statement(s) is/are correct?
(1) A only (2) B only (3) C only (4) A and B only (5) A and C only

26 Consider the following statements on Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM):
A - Registers are made of DRAM
B - DRAM is faster than SRAM
C - DRAM is more dense than SRAM
Which of the above statement(s) is/are correct?
(1) A only (2) B only (3) C only (4) A and B only (5) B and C only

27. ABC Holdings is a manufacturing organization in Sri Lanka which has its head office in Japan. What is the most convenient method to conduct weekly progress review meetings between the local staff in Sri Lanka and the senior management team in Japan?
(1) Telephone calls (2) Skype (3) E-mail (4) SMS (5) YouTube

● Questions **28** to **31** are based on an algorithm represented by the following flow chart.



28. Consider the following statements:
A - This algorithm takes only a single input.
B - This algorithm does not have any repetition(loop).
C - If the user inputs -1 for X, the algorithm will not terminate.
D - When the user inputs 1 for X, the algorithm will not terminate till the user enters another value.
Which of the above statement(s) is/are correct?
(1) A only (2) A and B only (3) A and D only
(4) B and C only (5) C and D only

29. The algorithm represented by the flowchart is considered as a poor algorithm because it does **not**
(1) terminate for some input values.
(2) contain finite number of steps.
(3) specify the next step to be performed at least for a one step of the algorithm.
(4) consist of a sequence of steps.
(5) contain any variable type declarations.

30 The algorithm terminates
(1) for input value 5.
(2) when values 0,5,4 are given as input one after the other.
(3) by printing the value 5 when it is given the input values 2,5,4 one after the other.
(4) by printing the value 4 when it is given the input values 2,5,4 one after the other.
(5) by printing the value 9 when it is given the input values 2,5,4 one after the other.

[See page five

31. Which of the following Python programs implements the behaviour of the flowchart?

(1)
```
x = int(input("Enter a value : "))
n = 1
t = 0
while n <= x:
    y = int(input("Enter the next value: "))
    t = t + y
    n = n + 1
print(t)
```

(2)
```
x = int(input("Enter a value : "))
n = 1
t = 0
while n <= x:
    y =int(input("Enter the next value: "))
    t = t + y
    n = n + 1
    print(t)
```

(3)
```
x = int(input("Enter a value : "))
n =1
t = 0
iterate = True
while n != x:
    y = int(input("Enter the next value: "))
    t = t + y
    n = n + 1
print(t)
```

(4)
```
x = int(input("Enter a value : "))
n = 1
t = 0
while n != x:
    y =int(input("Enter the next value: "))
    t = t + y
    n = n + 1
    print(t)
```

(5)
```
x = int(input("Enter a value : "))
n =1
t = 0
iterate = True
while iterate:
    y = int(input("Enter the next value: "))
    t = t + y
    if n == x:
        iterate = False
    else:
        n = n + 1
print(t)
```

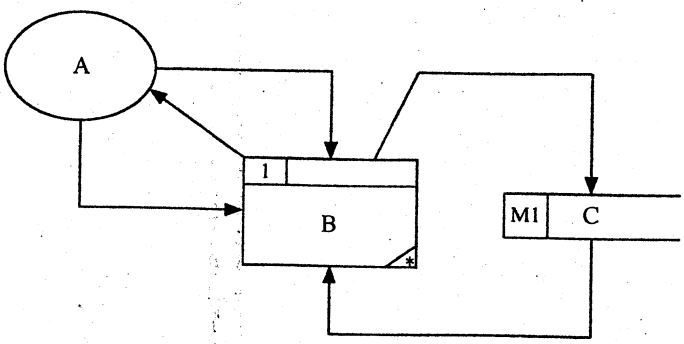
32. Consider the following statement regarding an Automatic Teller Machine (ATM) of a bank:

"System shall dispense cash in less than 10 seconds."

Which of the following is correct with respect to the above statement?

(1) This is an essential non-functional requirement.
(2) This is a nice to have non-functional requirement.
(3) This is an essential functional requirement.
(4) This is a nice to have functional requirement.
(5) This is not a requirement of the system.

33. Consider the following Data Flow Diagram:



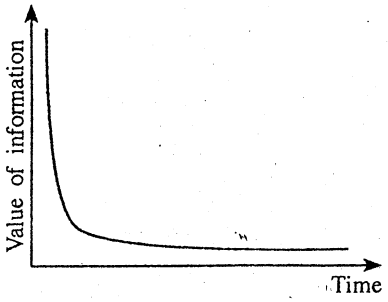
According to the Structured System Analysis and Design Methodology (SSADM), the components A, B and C in the above diagram represent ..... respectively.

(1) an external entity, a process and a data flow
(2) a process, an entity and a data store
(3) a user, a process and a table in an electronic database
(4) a user, a function and a table in an electronic database
(5) an external entity, a process and a data store

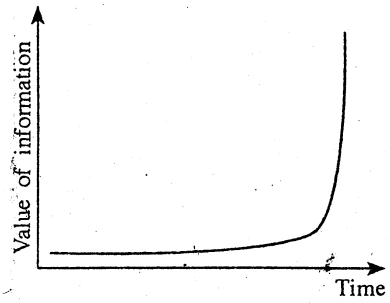
[See page six

34. Which of the following statements is correct with respect to openness and closeness of a system?
(1) An Automatic Teller Machine of a bank should be a close system.
(2) A general purpose computer can be considered as an open system.
(3) Human blood circulatory system is an open system.
(4) A mobile phone is a close system.
(5) A solar power generation system is a close system.

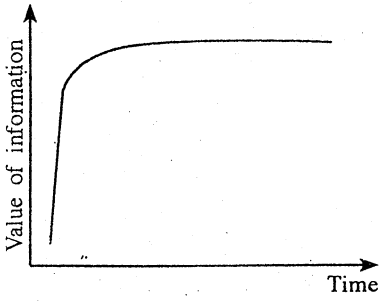
35. Which of the following graphs illustrates the Golden rule of information?



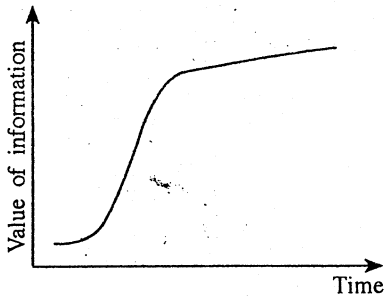
(1)



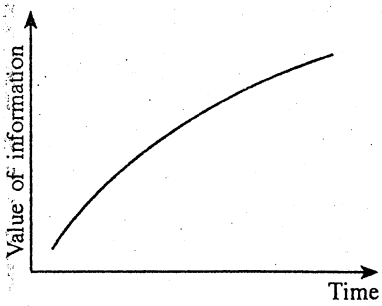
(2)



(3)



(4)



(5)

- Consider the following relations to answer questions from **36** to **38**.

programmer (programmerId, programmerName, gender, NIC, mobilePhoneNumber, degree, universityName)
client(clientId, clientName, address, telephoneNumber)
project(projectId, projectName, clientId, startDate, endDate, cost)
workFor(programmerId, projectId, startDate, endDate)

36. Consider the following statements:
A - A programmer works for at most one project at any given time.
B - A programmer is assigned to a single client at any given time.
C - One client can have more than one project.

Which of the above statement(s) is/are **always** correct?
(1) A only (2) B only (3) C only (4) A and B only (5) B and C only

37. Which of the following is correct with respect to attributes of the relations?
(1) Attributes gender, NIC and mobilePhoneNumber are candidate keys of programmer relation.
(2) Attribute startDate is a derived attribute.
(3) Attribute NIC can be considered as an alternate key for the programmer relation.
(4) Attribute startDate is a foreign key for the workFor relation.
(5) Each record in the workFor relation can be uniquely identified by using projectId.

38. Which of the following is correct?
(1) All relations are in 3rd normal form.
(2) All relations except the programmer are in the 3rd normal form.
(3) All relations except the client are in the 3rd normal form.
(4) All relations except the project are in the 3rd normal form.
(5) All relations except the workFor are in the 3rd normal form.

|See page seven

39. Consider the following database constraints:
A - Primary key
B - Data type
C - Foreign key
Which of the above constraint/s does/do **not** allow users to duplicate data in a database table?
(1) A only (2) B only (3) A and B only (4) A and C only (5) B and C only

• Consider the following four relational database tables to answer questions **40** and **41**.

item table

item	product
T001	Laptop
T002	TV
T003	Camera

supplier table

supplier	name
S001	BeLap Company Ltd.
S002	DigiTV trading company

itemSupplier table

item	supplier
T001	S001
T002	S001
T002	S002

delivery table

item	supplier	batch	quantity	date
T001	S001	B01	450	1.5.2015
T002	S001	AB1	45	1.5.2015
T001	S001	B02	500	2.5.2015
T001	S002	C01	75	5.5.2015

40. Which of the following actions is taken by a database management system when the SQL statement "delete from item" is executed?
(1) It will ask the user to select records for deletion.
(2) It may delete all the records from the 'item' table.
(3) It will drop the 'item' table.
(4) It will not delete any record from the 'item' table.
(5) The SQL statement will not be executed since it has errors.

41. Which of the following is correct with respect to the above tables?
(1) All the tables are in third normal form.
(2) Normalization has been applied to these tables.
(3) Integrity constraints are correctly applied to these tables.
(4) There is no evidence to say that integrity constraints are properly applied.
(5) Normalization and integrity constraints are properly applied.

42. What is the two's complement representation of 6_{10}?
(1) 11111010 (2) 00000110 (3) 11111001 (4) 01011111 (5) 00000101

43. A file of 1 MB has been successfully sent from the machine X to machine Y in a network over a TCP connection. It has been observed that the 10th byte of the file has passed through the router R. Consider the following statements regarding this communication:
A - The 10,000th byte must have gone through the router R after the 10th byte.
B - The 10,000th byte must have gone through the same path from X to Y as the 10th byte.
C - The 10,000th byte may or may not have gone through the router R.
Which of the above statement(s) is/are correct?
(1) A only (2) B only (3) C only (4) A and B only (5) B and C only

[See page eight

- Questions from **44** to **47** are based on the following Python program.

```
# Program - p1.py
temp = [23,45,2,-2,0]

def f(b):
    n1,n2 = b[0],b[0]
    for m in b:
        if(m > n1):
            n1 = m
        if(m < n2):
            n2 = m
    return n1,n2

print(f(temp))
```

44. Consider the following statements about this Python code:
    A - It contains a comment.
    B - It contains a definition of a function.
    C - It does **not** contain any selections.
    D - It does **not** contain any iterations.
    Which of the above statements are correct?
    (1) A and B only (2) A and C only (3) B and C only
    (4) B and D only (5) C and D only

45. What is the data type of the variable **temp** in this Python code?
    (1) Integer (2) Float (3) Boolean (4) Tuple (5) List

46. What is the return data type of the function named "**f**"?
    (1) Integer (2) Float (3) Boolean (4) Tuple (5) List

47. Which of the following value/s is/are in the output of the above program?
    (1) 23 and 45 (2) 45 and –2 (3) –2 and 0 (4) 0 (5) 23

48. Consider the following Python program:
    ```
    temp = [23,45,2,-2,0]
    print(temp[::2])
    ```
    What is the output of the above program?
    (1) [23,45] (2) [–2,0] (3) [23,2,0] (4) [2,–2,0] (5) [23,45,2,–2,0]

49. Which of the following is **incorrect** about software agents?
    (1) They exhibit some degree of autonomy.
    (2) They are a subset of reactive systems.
    (3) They are proactive in terms of their ability to exhibit goal-directed behaviour.
    (4) Electronic commerce is one of the key application areas of them.
    (5) They are always cooperative in a multi-agent environment.

50. Which of the following is/are examples for artificial intelligence techniques?
    A - Neural Networks
    B - Genetic Algorithms
    C - Ubiquitous Computing
    (1) A only (2) B only (3) A and B only (4) A and C only (5) B and C only

* * *

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

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
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தகவல், தொடர்பாடல் தொழினுட்பவியல்	II
Information & Communication Technology	**II**

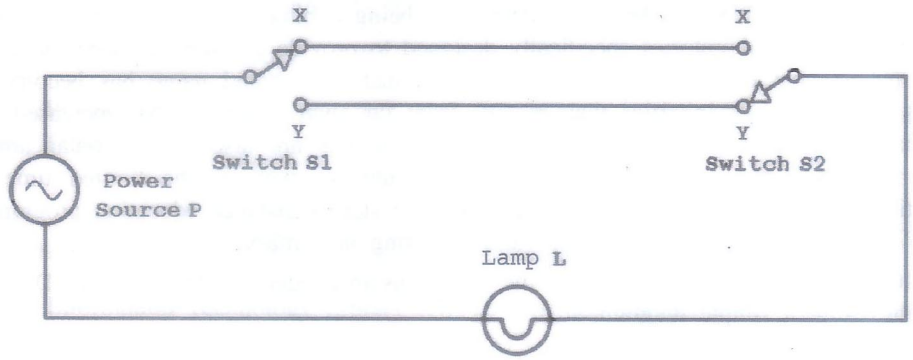
20 E II

Part B

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Where

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

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

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

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

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

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

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

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

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

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

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

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

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