



# General Certificate of Education (Adv. Level) Examination Fourth Term - 2021

Conducted by Field Work Center (FWC), Thondaimanaru  
Information & Communication Technology (ICT)

தகவல், தொடர்பாடல் தொழினுட்பவியல் I  
Information & Communication Technology I

Two Hours

Gr. 13 (2021)

20

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I

## Instructions

- ❖ Answer all questions.
- ❖ Write down your index number on the space provided.
- ❖ In each of the questions 1 to 50, pick one of the alternatives (1),(2),(3),(4),(5) which is correct or most appropriate. Mark a cross (X) on the number corresponding to your choice in the answer sheet provided.
- ❖ No use of calculators.

1. Which of the following has the fastest data accessing speed?

- (1) Register
- (2) Cache memory
- (3) Hard disk
- (4) Flash drive
- (5) Main memory

2. Which of the following is a block containing memories and secondary storage device found in ascending order from left to right?

- (1) Cache memory, Main memory, Register, Harddisk
- (2) Main memory, Register, Cache memory, Harddisk
- (3) Harddisk, Register, Cache memory, Main memory
- (4) Register, Cache memory, Main memory, Harddisk
- (5) Register, Cache memory, Harddisk, Main memory

3.  $AB9_{16}$  is equivalent to.

- (1)  $7612_8$
- (2)  $7651_8$
- (3)  $5271_8$
- (4)  $5432_8$
- (5)  $4532_8$

4. Two's complements of  $9_{10}$  and  $(-6)_{10}$  are respectively.

- (1)  $00000110_2$ ,  $11110111_2$
- (2)  $10000110_2$ ,  $10010111_2$
- (3)  $11000110_2$ ,  $11100111_2$
- (4)  $11100110_2$ ,  $11100011_2$
- (5)  $00001001_2$ ,  $11111010_2$

5. The area containing the addresses of the next instruction to be brought into the central processing unit is called.

- (1) Program Counter (PC)
- (2) Arithmetic Logic Unit
- (3) Control Unit
- (4) Register
- (5) Main memory

[see page no. 2]

6. Which of the following is a valid subnet mask?

- (1) 0.255.0.255 (2) 0.255.0.0 (3) 255.255.255.240  
(4) 0.0.0.255 (5) 255.255.0.256

7. Which of the following is an equivalent to the Boolean expression  $\overline{(A.B)}. \overline{(A+B)}. C$  ?

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

8. Which of the following can be considered as part of a data definition language (DDL)?

- (1) SELECT (2) INSERT (3) UPDATE (4) ALTER (5) DELETE

9. Consider the following statements about operating system.

- A - Scheduling processes  
B - Allocating and resolving memory required for processes  
C - Protecting computers from virus infections

Which of the above is /are the functions of operating system?

- (1) A only (2) B only (3) A,B only (4) A,C only (5) A,B,C all

10. Consider the following statements about memory technologies.

A - Static Random Access Memory (SRAM) is more expensive than Dynamic Random Access Memory (DRAM)

B - Dynamic Random Access Memory is used as a technology for register

C - Static Random Access Memory is more speed than Dynamic Random Access Memory

Which of the above is /are correct?

- (1) A only (2) B only (3) C only (4) A,C only (5) A,B,C all

11. Which of the following statement is true?

- (1) Ada Augusta Lovelace is considered as first computer programmer  
(2) Pascaline developed by Blaise Pascal reads data by punch card  
(3) Pascal was able to do calculations such as addition, subtraction and multiplication  
(4) John Von Neumann designed analytical engine  
(5) Difference engine was developed by Blaise Pascal

12. What is the value of Python statement  $5//2^3+2$  ?

- (1) 3 (2) 7 (3) 2 (4) 8 (5) 1

13.  $456_{16} + 27_{16} =$

- A -  $2175_8$   
B -  $10001111101_2$   
C -  $47D_{16}$

- (1) A only (2) A,B only (3) A,C only (4) B,C only (5) A,B,C all

[see page no. 3

**14.** Which of the following can be functional requirement of online hotel room reservation system?

- (1) Visitors shall be able to reserve the room
- (2) Users should be able to have an easy user interface to operate without further training
- (3) Availability of the room should be able to be displayed before it is reserved
- (4) System should be able to have fast response time (e.g. less than 3 seconds)
- (5) System should be able to be secure in order for members' data to be protected

**15.** In computer networks, which of the following is the function of IMAP (Internet Message Access Protocol)?

- (1) Monitoring network devices in the Internet
- (2) Helping users in order to receive e-mail messages from mail server
- (3) Sending e-mail messages to the mail server
- (4) Transferring files from one computer to another in the Internet
- (5) Routing data packets in the Internet

**16.** Which of the following is characterized by a double line rectangular symbol in entity relationship (ER) diagram?

- (1) Strong entity
- (2) Derived attribute
- (3) Weak entity
- (4) Multi-valued attribute
- (5) Identifier attribute

**17.** Consider the followings.

- A - Amplitude
- B - Frequency
- C - Phase
- D - Wave length

Which of the above is /are the properties of a signal?

- (1) A only      (2) B only      (3) B,C only      (4) A,B,C only      (5) A,B,C,D all

**18.** Consider the followings.

- A - Latency
- B - Bandwidth
- C - Attenuation
- D - Topology

Which of the above is /are the properties of a signal transmission media?

- (1) A only      (2) B only      (3) B,C only      (4) A,B,C only      (5) A,B,C,D all

**19.**  $19.625_{10} =$

- (1)  $10011.101_2$
- (2)  $11001.101_2$
- (3)  $10100.100_2$
- (4)  $11001.111_2$
- (5)  $10011.110_2$

[see page no. 4

**20.** Consider the following statements.

A – DNS server maps domain names into corresponding IP addresses

B – DHCP server caches recently accessed webpages

C – FTP server allocates IP addresses to the network devices automatically

Which of the above statement(s) is /are correct?

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

**21.** Which of the following information is not generally contained in the process control block (PCB) of an operating system?

- (1) Process number
- (2) Capacity of hard disk
- (3) Process scheduling state
- (4) Program counter
- (5) Process state

**22.** In computer networks, “UDP (User datagram protocol) is functioning in ..... layer of OSI network reference model”.

Which of the following is appropriate to fill the blank in?

- (1) Physical
- (2) Transport
- (3) Network
- (4) Datalink
- (5) Application

**23.** Which of the following is the order of testing performed during software development from left to right?

- (1) Integration testing, user acceptance testing, unit testing, system testing
- (2) Unit testing, system testing, user acceptance testing, integration testing
- (3) Integration testing, system testing, unit testing, user acceptance testing
- (4) System testing, user acceptance testing, unit testing, integration testing
- (5) Unit testing, integration testing, system testing, user acceptance testing

**24.** Which of the following(s) is /are the characteristic(s) of UDP (User Datagram Protocol) in comparison with TCP (Transmission Control Protocol)?

- A - Connection-oriented
- B - Low overhead
- C - Guaranteed delivery
- D - Unreliable service

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

**25.** “The primary key field values of a table in a relational database do not contain repetitive values”.

What type of integrity constraint is this?

- (1) Entity integrity constraint
- (2) Referential integrity constraint
- (3) Domain integrity constraint
- (4) Attribute integrity constraint
- (5) Domain integrity constraint

[see page no. 5

26. “Public key encryption is also called .....”.

Which of the following is most appropriate to fill the blank in?

- (1) Private key encryption
- (2) Textual encryption
- (3) Digital encryption
- (4) Symmetric encryption
- (5) Asymmetric encryption

27. Consider the following “Customer” data table.

CustomerID	CustomerName	Address	ContactNo
CU_01	V.Ramanan	Jaffna	0212226547
CU_02	M.N.Perera	Colombo	0112334545
CU_03	K.Nishobikha	Kandy	0776577359
CU_04	A.M.H.Asraf	Jaffna	0767837387

In this table, which of the following SQL statement can be used to change the address of a customer to “Colombo” who has the **CustomerID** ‘CU\_01’?

- (1) UPDATE Customer SET Address='Colombo';
- (2) UPDATE Customer Address='Colombo' WHERE CustomerID='CU\_01';
- (3) UPDATE Customer SET Address='Colombo' WHERE CustomerID='CU\_01';
- (4) INSERT Customer SET Address='Colombo' WHERE CustomerID='CU\_01';
- (5) SELECT Customer UPDATE Address='Colombo' WHERE CustomerID='CU\_01';

28. Which of the following is not a part of microprocessor?

- (1) Instruction register
- (2) Program counter
- (3) Cache memory
- (4) Main memory
- (5) Control unit

29. Which of the following is a logical operator in Python programming?

- (1) \*
- (2) OR
- (3) %
- (4) <=
- (5) //

30. Consider the following statements about software process models.

- A – Tasks are divided into time slices in order to provide specific features for a release
- B – This is an iterative approach with software development being provided after each iteration. Each release has an incremental development and the final product will have all the functionalities requested by the user
- C – Gaining user experience in software from the very beginning of the software development

Which of the above can be considered as the characteristics of the agile process model?

- (1) A only
- (2) B only
- (3) C only
- (4) A,B only
- (5) A,B,C all

[see page no. 6

31. Consider the following Boolean function.

$$f(A, B, C) = A.B + A.C + B.C$$

What is the minimum number of NAND gates required if the above Boolean function is implemented by using NAND gates only?

- (1) 2                      (2) 3                      (3) 4                      (4) 5                      (5) 6

32. Consider the following statements.

A – Python is a fourth generation computer programming language

B – Programs written in second generation computer programming language do not required translators to be executed on a computer

C – Programs written in first generation computer programming language are required translators to be executed on a computer

Which of the above statement(s) is /are correct?

- (1) A only                      (2) B only                      (3) A,B only                      (4) A,C only                      (5) A,B,C all

33. “In OSI reference model, transport layer contributes ..... communication”.

Which of the following is most appropriate to fill the balnk in?

- (1) Process to process  
(2) Node to node  
(3) Source to destination  
(4) Router to switch  
(5) Hop to hop

Consider the following “Order” table to answer the questions 34 and 35.

This data table contains the order details for the items. Each order is carried out on a specific date and it contains different items in different quantities.

**Order**

<u>OrderNo</u>	<u>ItemNo</u>	<u>Description</u>	<u>Date</u>	<u>Quantity</u>
1	12	Screw	6/1/2015	100
1	15	Bolt	6/1/2015	50
2	7	Flange	2/2/2015	10
2	15	Bolt	2/2/2015	40
2	12	Screw	2/2/2015	80

34. Which of the following is correct about this table?

- (1) It is in zero normal form (0NF)  
(2) It is in first normal form (1NF)  
(3) It is in second normal form (2NF)  
(4) It is in third normal form (3NF)  
(5) Data are not enough to determine its normal form

[see page no. 7

35. Which of the following group of tables will be obtained when the above table is converted to the next normal form?

- (1) Order (OrderNo, Date), Item (ItemNo, Description)
- (2) Order (OrderNo, Date), Item (ItemNo, Description, Quantity)
- (3) Order (OrderNo, Date, Quantity), Item (ItemNo, Description)
- (4) Order (OrderNo, Date), Item (ItemNo, Description), Order\_Item (OrderNo, ItemNo, Quantity)
- (5) Order (OrderNo, Date), Item (ItemNo, Description, Quantity), Order\_Item (OrderNo, ItemNo)

36. In operating system, consider the following statements about SPOOL (Simultaneous Peripheral Operations On Line).

- A – It is a buffer that holds the output for peripherals such as printer  
 B – It is a special area of memory or hard disk  
 C – It is accessible by input-output devices

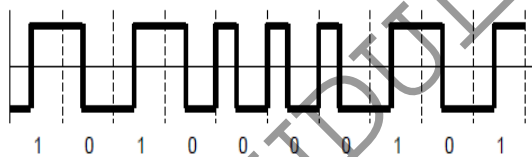
Which of the above statement(s) is /are incorrect?

- (1) A only                      (2) B only                      (3) A,B only                      (4) A,C only                      (5) A,B,C all

37. In software development, which of the following statement about waterfall model approach is incorrect?

- (1) It is most appropriate for the software development with clear and stable user's requirements
- (2) The user gets to experience the software only after it has been fully developed
- (3) It is difficult to adopt changing user's requirements
- (4) It can be proceeded to the next step only after completing the previous step
- (5) It is an iterative model

38. In data communication, consider the following signal encoding scheme used to be encoded the data '1010000101'.



Which of the following encoding scheme is used to be encoded by this diagram?

- (1) NRZ                      (2) NRZ-I                      (3) Manchester                      (4) RZ                      (5) NRZ-L

39. What is the simplified Boolean expression given the following Karnaugh map?

BC					
		00	01	11	10
A	0	1	0	0	1
	1	1	1	0	1

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

**40.** Which of the following is an invalid Python variable?

- (1) `_x_y`                      (2) `xy`                      (3) `x_y`                      (4) `x2`                      (5) `2x`

**41.** Consider the following statements about computer malware.

A - Computer virus replicates itself and spreads from one computer to another.

B - Trojan horse first seems to be useful to the user before it is installed on the computer and steals useful information once installed.

C - Computer worm replicates itself and spreads from one computer to another using the computer network without user intervention.

Which of the above is /are correct statement(s)?

- (1) A only      (2) B only      (3) C only      (4) B,C only      (5) A,B,C all

Consider the following scenario to answer questions for **42** and **43**.

In a computer network, If a machine is assigned an IP address of 192.248.16.132 and a subnet mask of 255.255.255.192:

**42.** What is the CIDR notation of this subnet mask?

- (1) /24                      (2) /32                      (3) /25                      (4) /16                      (5) /26

**43.** How many maximum of IP addresses can be assigned to machines in this network?

- (1) 126                      (2) 14                      (3) 30                      (4) 62                      (5) 6

**44.** Consider the following statements.

A – GNU / Linux is a proprietary operating system

B – MS-Windows is an open source operating system

C – Open source software offers the user greater freedom of use, modification, and sharing

Which of the above is /are correct?

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

**45.** Which of the following is the order of the life cycle of the data processing?

A – Input

B – Collection

C – Process

D – Storage and output

- (1) A,B,C,D      (2) B,D,C,A      (3) A,C,B,D      (4) B,C,D,A      (5) B,A,C,D

**46.** Consider the Uniform Resource Locator (URL) <https://www.edupub.gov.lk>. What is the domain name of this URL?

- (1) `www`  
(2) `.lk`  
(3) `http`  
(4) `edupub.gov.lk`  
(5) `https`

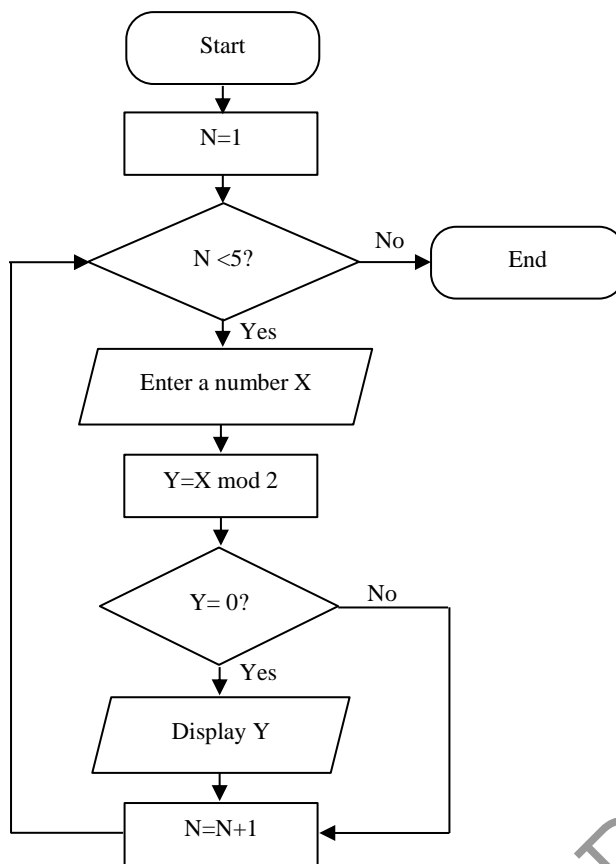
**47.** Which of the following testing strategy will concern the internal implementation of the system?

- (1) Blackbox testing  
(2) Whitebox testing  
(3) Integration testing  
(4) Acceptance testing  
(5) Unit testing

[see page no. 9



48. What is the output of 100, 70, 81, 77 and 84 as consecutive user inputs for the following flowchart?



- (1) 81,77    (2) 100,70,81,77,84    (3) 77,84    (4) 100,70,84    (5) 100

49. What will be the output when using  $Y = 1$  instead of  $Y = 0$  in the flow chart given above in (48)?

- (1) 81,77    (2) 100,70,81,77,84    (3) 77,84    (4) 100,70,84    (5) 100

50. Consider the following statements about computer network connectivity devices.

A - It uses protocols to find the best routes while sending data packets between at least two computer networks.

B - It is a data packet forwarding device that filters data packets between segments of a local area network and operates within the data link layer of the OSI reference model.

C - It provides a common connection point for devices on the network while copying incoming data packets to all other ports.

The most suitable devices for A,B and C are respectively.

- (1) Router, Switch, Hub  
 (2) Router, Hub, Switch  
 (3) Switch, Hub, Router  
 (4) Hub, Router, Switch  
 (5) Hub, Switch, Router

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[end



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**Information & Communication Technology (ICT)**

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தகவல், தொடர்பாடல் தொழினுட்பவியல் II  
 Information & Communication Technology II

Three Hours

20

E

II

Gr. 13 (2021)

**Part – II A Structure Questions**

**Write down answers for all four questions on this sheet.**

1.

(a) Consider the following statements about data communication and computer networks. Fill the blanks in using the words given below in the list.

(i) ..... is the technique used to send information by modifying the basic characteristics such as frequency, amplitude and phase, of a modulating signal by attaching it to a higher frequency signal (carrier signal), producing a modulated signal.

(ii) ..... is used as the simplest form of error detecting code.

(iii) When a message is generated at the source, it is broken down into smaller units called packets. Each packet is assigned unique information to identify itself, switching information is added in the header of each packet and the transmitted independent of other packets via different paths. It is called .....

(iv) In OSI network reference model, ..... layer consists of two sub layers such as logical link control (LLC) and media access control (MAC).

(v) The frequency difference of two terminals in a data channel is called its .....

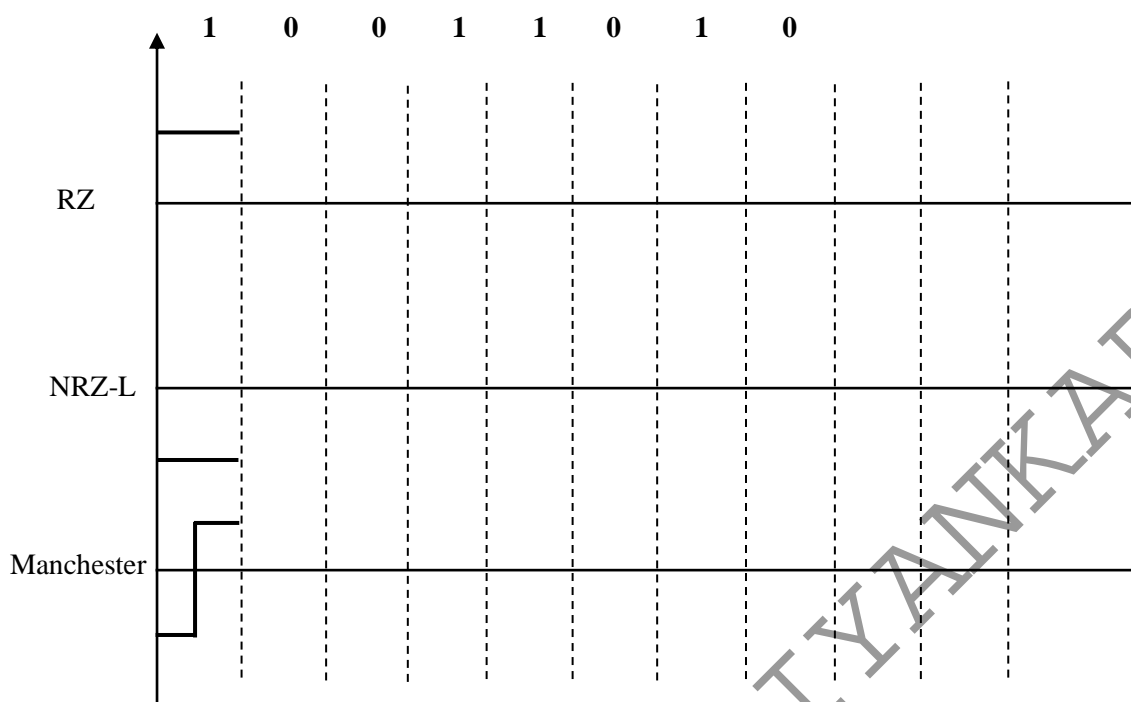
(vi) ..... is responsible for process-to- process packet delivery.

[Lists : Packet switching, Circuit switching, Modulation, Transport, Application, Parity bit, Datalink, Bandwidth]

[ see page no. 2

(b) In data communications, draw the each signal encoding schemes for the data 10011010 used in a data communication in the following diagram (their first bit is drawn. Draw others from it).

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(c) Write down the names of the layers of the OSI network reference model for each of the protocols, functions and devices of computer networks in the following table.

No.	Protocols / Functions / Devices	Name of Layer
(i)	Routing	
(ii)	Flow control	
(iii)	IMAP (Internet Message Access Protocol)	
(iv)	UDP (User Datagram Protocol)	
(v)	Hub	
(vi)	Error detection	
(vii)	Data compression and encryption	
(viii)	MAC addressing	

[ see page no. 3

2.

(a) Column A of the following table consists of the statements about software development. Write down suitable numbers for the words given in the list below to fill in the blanks in column B.

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No.	Column A	Column B
(i)	This model is suitable to start software development after the user requirements are collected fully and clearly.	
(ii)	Internal structures of a software are tested.	
(iii)	It is a technique to elicitate the user requirements.	
(iv)	In software development, the tasks are divided to time slices to deliver specific features for a release.	
(v)	Some part of the new system is installed first and executed successfully for considerable time period. When the results are found satisfactory then only other parts are implemented.	

[Lists : ① - Agile process model, ② - Pilot deployment, ③ - Parallel deployment, ④ - Prototype, ⑤ - Waterfall process model, ⑥ - Blackbox testing, ⑦- Whitebox testing]

(b) Consider the paging model given below for the logical and physical memories in an operating system. Pages are to be mapped to physical memory.

Logical memory

Page 0
Page 1
Page 2
Page 3
Page 4
Page 5

Page table

0	2	v
1	3	v
2	4	v
3	7	v
4	8	v
5	9	v
6	0	i
7	0	i

frame number

valid (v) - invalid  
(i) bit

Physical memory

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

[ see page no. 4

(i) In above diagram, show memory mapping by writing pages of physical memory in appropriate boxes.

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(ii) What is the role of page table?

.....

.....

.....

(c) The operating system uses various ways to allocate spaces for files. State any two characteristics of the contiguous memory allocation.

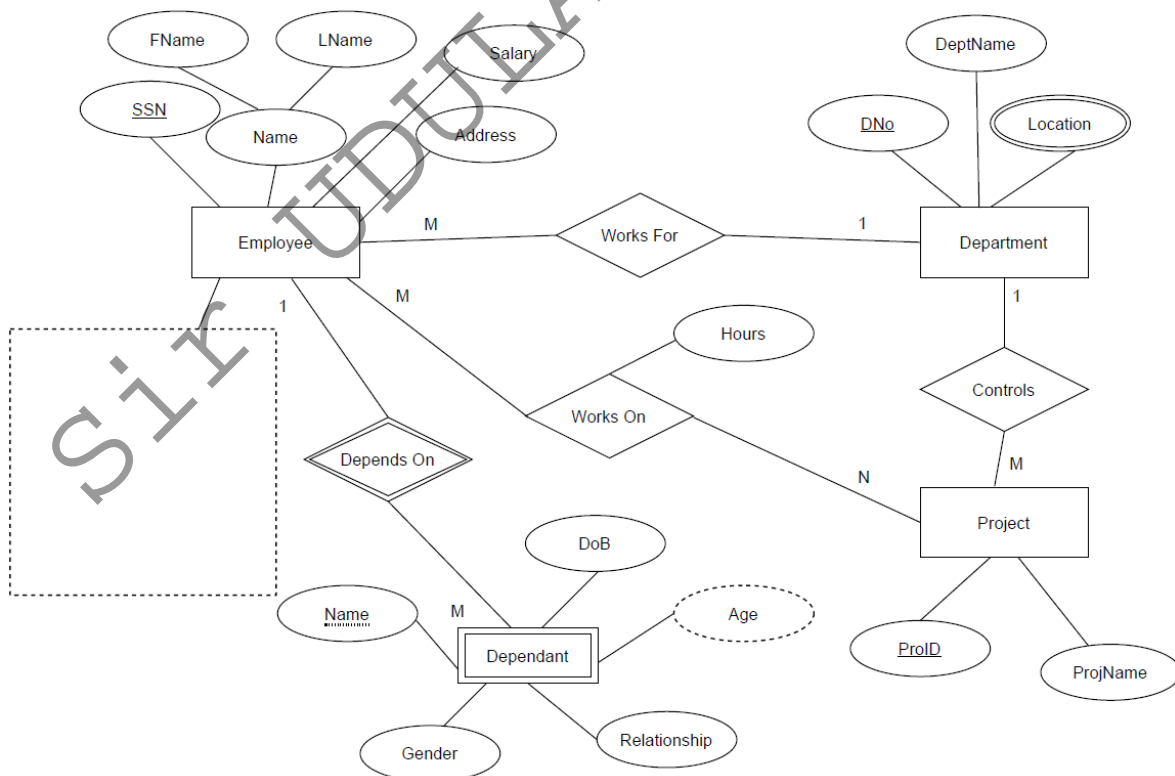
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3.

(a) A company wants to store data such as employees, departments, projects and dependants of employees in a database. The database design has the following EER diagram.



[ see page no. 5

Answer the following questions by using EER diagram given above.

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- (i) If this diagram is converted to the tables, write down tables obtaining with corresponding attributes.

.....

.....

.....

.....

.....

.....

- (ii) Write down the primary key to uniquely identify records in DEPENDANT entity.

.....

.....

- (iii) If entity EMPLOYEE can be in two types such as fulltime and parttime (but, not as both), draw those details in the box given in EER diagram.

- (iv) Write down a SQL statement to obtain the details such as SSN, Salary, and Address of employees by using the tables obtained in (i).

.....

.....

- (b) Consider the following Pseudocode.

*Begin*

*X = 1*

*T = 1*

*DO WHILE T < 50*

*PRINT (T)*

*X = X + 1*

*T = T + X*

*END WHILE*

*End*

[ see page no. 6

(i) Write down last three numbers of the output of this Pseudocode.

.....

(ii) How do you change this program in order to obtain square numbers as output in the range given?  
You are not required to add additional lines or change the program structure.

.....

4.

(a) Fill in the blanks of the statements given below from the following list as appropriate. Write the numbers in the list in the blanks.

**Lists:**

- ① Operational feasibility
- ② Cultural feasibility
- ③ Technical feasibility
- ④ Schedule feasibility
- ⑤ Economic feasibility
- ⑥ Legal feasibility

(i) ..... is a measure of how a proposed system solves problems.

(ii) ..... is a measure of the cost-effectiveness of a project or solution.

(iii) ..... is to know if the system is working in a given organizational climate.

(iv) ..... is to know whether the enough technology is in place to develop the proposed system.

(v) ..... is how much reasonable time required to complete a project.

(b) In computer networks, write down one advantage of slotted ALOHA in comparison with pure ALOHA using as multiple data channel access protocol.

.....

.....

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[ see page no. 7

(c) Steps for booting process of computer are given below not in order indicating by labels from A to C.

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column

Write down the appropriate labels in the boxes given below to order from left to right.

**A** - Transfer the control to the operating system.

**B** - POST or Run BIOS program.

**C** - Run Bootstrap program to load operating system to main memory.



(d) Choose the suitable words to fill the blanks in from the list given below. Write down only the appropriate numbers for the blanks.

- (i) Memory that is not lost data and instructions when power is switched off .....
- (ii) Protection of personal information in computer data bank from abuse is called data privacy .....
- (iii) It refers to the use of small and portable computing devices in wireless enabled networks that provide wireless connections to a central main server .....
- (iv) It is the attempt to acquire sensitive information such as usernames, passwords, and credit card details for malicious reasons, by masquerading as a trustworthy entity in an electronic communication .....
- (v) ..... contains frequently used instructions in the computer and is widely used to improve computer's performance.

**Lists:**

[① - Cache memory, ② - Volatile memory, ③ - Non-volatile memory ④ - Mobile computing, ⑤ - Telecommuting, ⑥ - Phishing, ⑦ - Data privacy]

\*\*\*\*\*

[ see page no. 8





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Information & Communication Technology II

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20

E

II

Gr. 13 (2021)

**Part – II B**

**Answer any four questions only.**

(5) Consider the following scenario.

A flashlight with a light sensor and a motion sensor are fixed outside the front door of the house. The light illuminates (ON-1) automatically when it is dark and someone is approaching the door from the outside. (when both conditions are met). When a person approaches the door, the motion sensor turns from OFF (0) state to ON (1) state. The light sensor is ON (1) state when it is in light condition and (0) when it is in dark condition. In addition, a manual switch (ON (1) , OFF (0)) is fixed to this circuit. It can be manually turned the flashlight on or off using the manual switch.

Assume that the light sensor (A), motion sensor (B) and flash light (C).

- (a) Write down Boolean expression for this system.
- (b) Construct truth table for the Boolean expression.
- (c) Write down this Boolean expression in the form of Sum Of Products (SOP).
- (d) Draw the logic circuit for the Boolean expression obtained in (a) above by using NAND gates only.
- (e) Draw the logic circuit again for the Boolean expression obtained in (a) above by using NOR gates only.

(6)

- (a) Write down one benefit of using variable length subnet mask (VLSM) rather than using of fixed length subnet mask (FLSM) while allocating IP addresses in a computer network.
- (b) Consider the following scenario.

A company situated in Colombo has its head office (management department) and other three departments in a big building. Those particulars are as follows.

[ see page no. 9

Department	Number of computers
Sales and purchasing department	120
Development department	50
Accounting department	26
Management department	5

An IP block 192.168.1.0/24 is given for this purpose. You are required to **allocate IP addresses as efficiently as possible not to waste for all computers** (hosts and servers) of head office and other departments. Four subnets are to be setup for this purpose and this network is connected to a public IP address for the Internet usage of the employees. A firewall is installed for network security and four switches, network cables, proxy server and DHCP server are given to you for this purpose. Subnet of the head office is connected directly to the Internet.

Draw a network diagram for this scenario. Show all the IP addresses, network connectivity devices and servers clearly.

**Note:** Use the following table as a help to allocate IP addresses.

Subnet	Network address	Subnet mask	IP address range
Sales and purchasing department			
Development department			
Accounting department			
Management department			

- (c) Two communication devices use single-bit even parity bit method to detect errors. While computer A is sending the bits 11011101, computer B receives the data 10011100 by causing a problem in the data channel. State whether computer B will detect error or not with a brief reason.

(7)

(a) Consider the following 'Employee' data table.

**Employee**

<u>EmpNo</u>	Name	BranchLocation	NetSalary	Position
E_01	R.R.Vimal	Jaffna	45000	Clerk
E_02	K.V.Perera	Galle	55000	Tech.Assistant
E_03	A.M.L.Hakeem	Kandy	50000	Hardware Tech.
E_04	V.Niluksha	Jaffna	70000	HR Officer
E_05	J.Jayaweera	Colombo	80000	Manager
E_06	A.M.Nathan	Colombo	60000	Asst. Manager

(i) Write down appropriate SQL statement to create 'Employee' data table.

(ii) Write down SQL statement to change only the employee's NetSalary of an employee 'E\_02' to 60000.

(b) Consider the following scenario regarding football clubs, sports teams and matches between them.

A football club has a name, a stadium with a playground, and a team made up of players. A player can play for only one club. Each team is managed by a manager, represented by his /her name. A player has a registration number, name, and age. A club manager buys players. Each club plays against every other club in the league, and each match has a date, stadium venue, and score.

Draw ER (Entity Relationship) diagram for this scenario. State all the assumptions you have made.

(8)

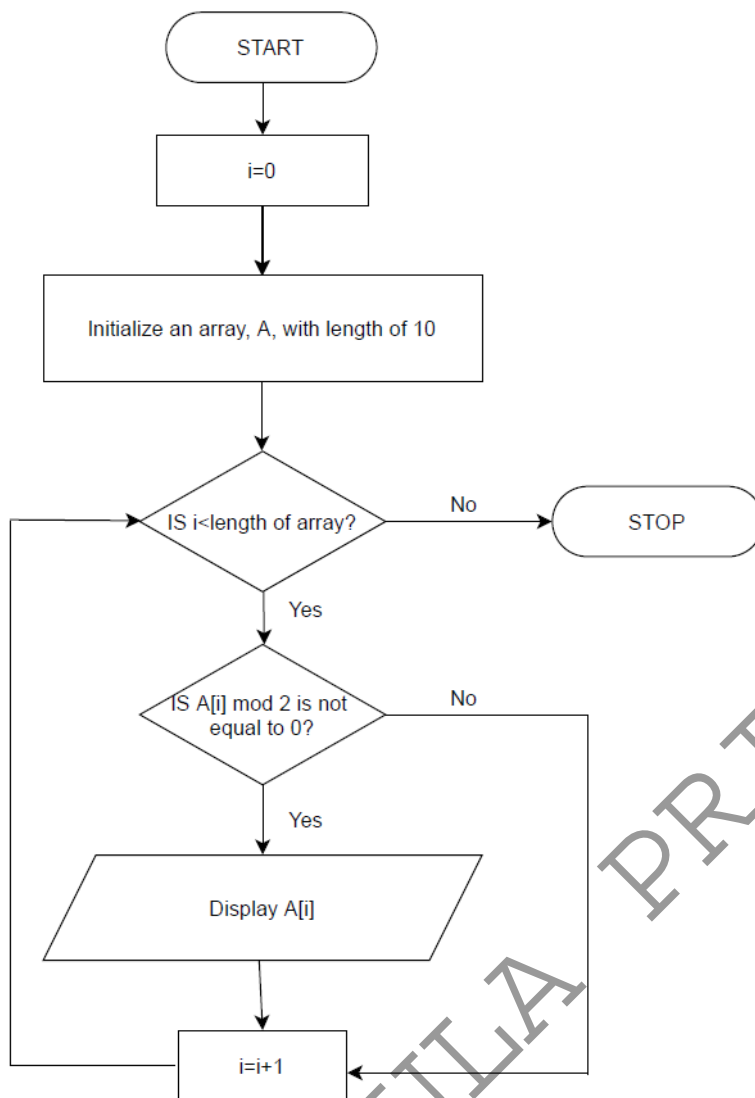
(a) Compare and contrast first generation and third generation computer programming languages (three features are sufficient to compare).

(b) When a user enters certain positive and negative numbers (n) one by one, each of those numbers should be displayed whether it is an "odd number" or "even number".

Construct a flowchart for this situation.

[ see page no. 11

(c) Consider the following flowchart.



(i) What would be the output if set of numbers 17,34,68,9,40,60,23,76,80,6 are stored in an array?

(ii) What is the purpose of this algorithm?

(9) Consider the following scenario.

One of the largest private hospital in the country's capital currently manages all its day-to-day operations manually. These include registering patients, maintaining doctors' records, assigning doctors to patients, maintaining details of other hospital employees, paying employees' payments and maintaining stocks such as hospital drugs. The hospital management considers that there are massive errors and inefficiencies in the operation of this manual system. To address this, it decided to seek the views of the top management and convened a meeting. It was decided that it would be best to computerize all manual hospital operations.

[ see page no. 12

- (a) State three functional requirements of this system.
- (b) State two non-functional requirements of this system.
- (c) Briefly explain one reason why COTS (commercial-off-the-shelf) software can be used when computerizing hospital operations and one reason against using it.
- (d) Briefly explain one reason why a customized software may be the best alternative to the solution mentioned above (c).
- (e) State briefly one advantage and one disadvantage of hiring other companies to implement this system.

**(10)**

- (a) Consider the following scenario.

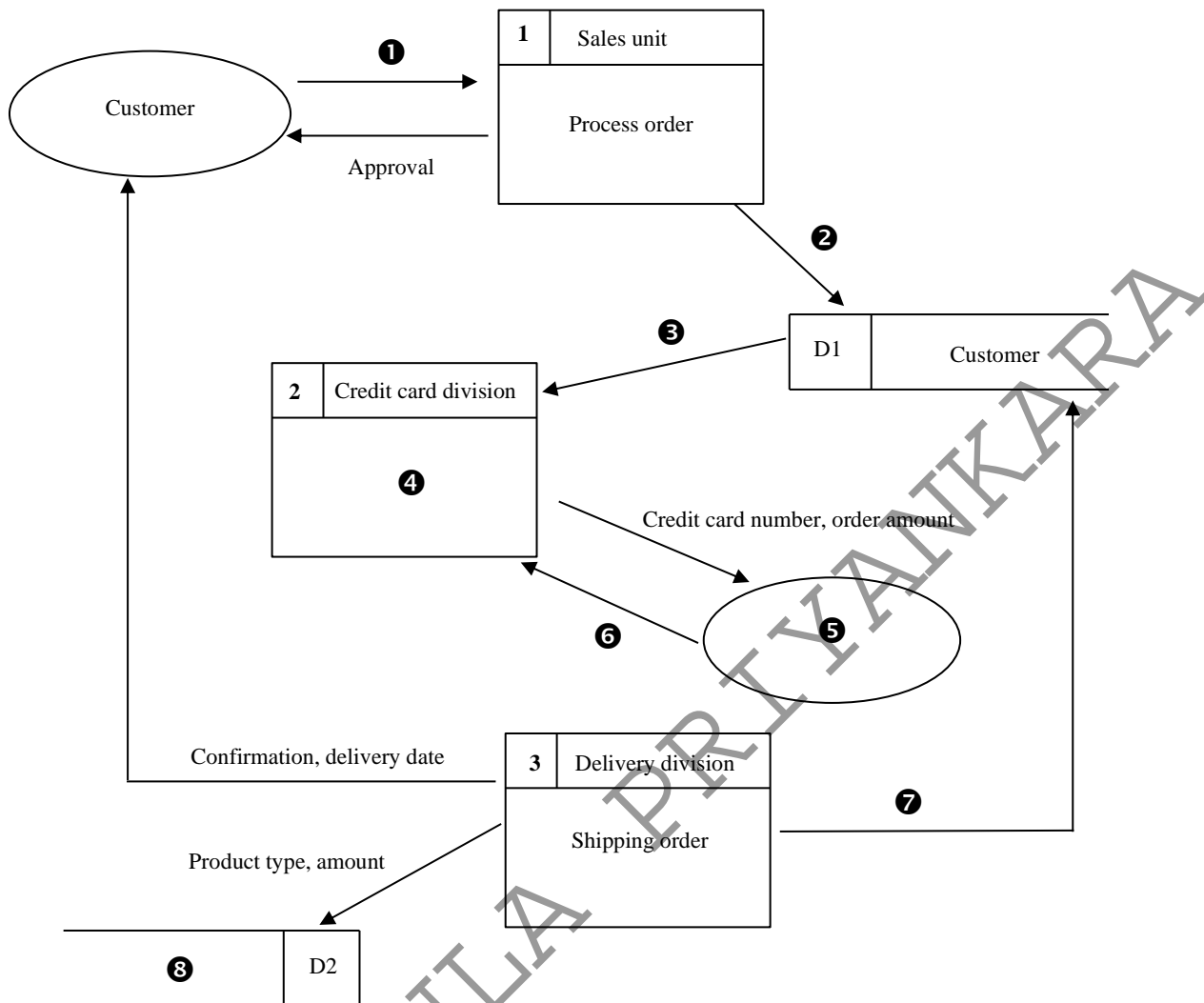
A hospital management system is used by a hospital to collect data from patients and then store it for future use. The main goal of the hospital management system is to accurately treat patients and reduce overtime pay for employees. In addition, various features are included in the hospital management system. Some of them are patient registration, patient testing and report generation.

Some of the functional and non-functional requirements of this system are given below.

- (A) Details about patients should be able to keep recorded while they are first admitted to the hospital.
- (B) The system should be able to obtain the details of patients (name, phone number, age, date of admission, doctor's name, number of days admitted, date of discharged) as reports.
- (C) The system should be able to be available 24 hours a day.
- (D) The system should be able to perform data backup every day in an efficient way.
- (E) The system's user interface shall be able to use easy for users after a very short training.
- (F) The system should be able to respond in approximately one second when checking patients' information.
- (G) Information about current condition of the patients should be able to be obtained from the system when they leave the hospital after treatment.
- (H) The system must be able to provide access up to 10 users simultaneously over the network.

Classify the above mentioned functional and non-functional requirements separately (it is sufficient to write only their labels).

(b) The Segment of first level data flow diagram (Level 1 DFD) for an ordering system of products in electronic commerce is given below.



Customers can place an order for the products at an e-commerce company. The order is processed by the sales unit. Customer and order information are then sent to the customer data store. The customer's credit card details are verified by the credit card division. The credit card number is then processed by the credit card company and the credit card approval or rejection is sent to the credit card division. At the end, the delivery division carries out the process of shipping the order. Also the order information is sent to the customer file and the details such as confirmation date and delivery date are sent to the customer file. Product type and amount are stored in the stock file.

Write down the labels from ① to ⑧ given in the data flow diagram using appropriate words.

(c)

- (i) Briefly describe two reasons why a newly developed software which is implemented in user environment should be included in the maintenance phase.
- (ii) Write down briefly a major difference between black box testing and white box testing.

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[ End.