National Field Work Center,

Conducting

G.C.E. (Advanced Level) Examination - 2024 , Term - 4

Information & Communication Technology [ICT]

தகவல், தொடர்பாடல் தொழினுட்பவியல் I Information & Communication Technology I	20	E	I	இரண்டு மணித்தியாலம் Two hours

Instructions:

- *Answer all the questions.*
- *Write down 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* (1),(2),(3),(4),(5) *which is correct or most appropriate and mark a cross (X) in accordance with the instructions given on the back of the answer sheet.*
- *Use of calculators is not allowed.*

Part - I

1. Which of the following statements about computer software is **correct**?

(1) Ubuntu Linux is an example of a proprietary software
(2) An operating system is an example of application software
(3) Microsoft Windows is an operating system that must reside compulsorily in all computers
(4) Microsoft Office is an example of a system software
(5) Only application software compatible with the version of the operating system can be installed on the computer

2. Consider the following statements about the **POST** (Power On Self Test) process.

A - This is done by the BIOS program
B - Operating System does this
C - During this process, the main components like central processing unit, motherboard, main memory, hard disk, read only memory and video graphics card are checked

Which of the above is / are **correct**?

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

3. Consider the following statements about **cache memory**.

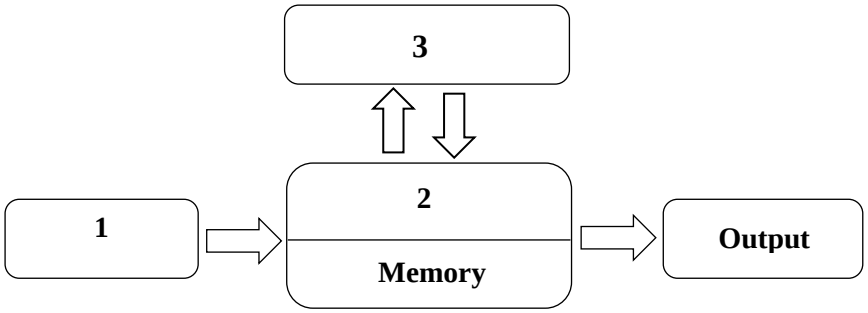
A - This is used to store frequently used instructions
B - This memory is very cost effective compared to main memory
C - This memory is in more storage capacity than the main memory
D - This memory is available in three levels such as L1, L2, and L3

Which of the above is / are **false**?

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

[*see page no. 2*

4. Consider the following **block diagram** of the general components of a computer.



Which of the following components are given by **1**,**2** and **3** respectively?
(1) Storage, input, central processing unit
(2) Input, central processing unit, storage
(3) Arithmetic logic unit, central processing unit, storage
(4) central processing unit, storage, input
(5) Input, central processing unit, control unit

5. Consider the following paragraph.

Registers are the fastest-access memory locations in the central processing unit. …. **A** ……. saves the result of the arithmetic and logical unit of calculations performed. The ……. **B** ……. contains the memory location for the next instruction to be processed. The …….. **C** ……contains information such as where to get the data it needs to fetch or where to store the data.

Which of the following are **suitable** for filling **A**,**B** and **C** respectively?
(1) Accumulator, program counter, memory address register
(2) Accumulator, program counter, memory address register
(3) Accumulator, program counter, memory address register
(4) Accumulator, program counter, memory address regsiter
(5) Accumulator, program counter, memory address regsiter

6. Students' personal information and their exam marks are entered into a student information system. Marks for a subject ranges between 0 and 100. A student has to study a combination of compulsory and optional subjects and appear for the relevant examination.

Which of the following is the **suitable data validation** for the above system?

A - A presence check for marks in all the subjects sat or not sat by the student
B - A range check to check that an input examination marks is in a range between 0 and 100
C - A data type check to ensure that the input carried out for the student's phone number contains only the digits

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

[*see page no. 3*]

7. Which of the following memory groups represents the **access speed** from left to right with the **ascending order**?

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

8. Which of the following(s) is / are **equivalent** to 101010001110_2 ?

A - 5216_8
B - 3234_{10}
C - $A8E_{16}$

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

9. If A = 10100010_2 and B = 11101010_2 ,what is the **value** of **A AND B** ?

(1) 00010101_2 (2) 11100010_2 (3) 01001000_2 (4) 00101010_2 (5) 10100010_2

10. What are the **two's complement** values of ($+14_{10}$) and (-22_{10}) respectively?

(1) 10011000_2 , 11110100_2
(2) 11111000_2 , 01101011_2
(3) 00001110_2 , 11101010_2
(4) 00010010_2 , 00010011_2
(5) 00010010_2 , 11110100_2

11. What is the **equivalent** to the Boolean expression $\overline{(\bar{A}+C).(\overline{AB})}$?

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

12. Consider the following Karnaugh map.

C \ AB	**00**	**01**	**11**	**10**
0	1	0	0	1
1	1	0	1	1

Which of the following **Boolean expression** is represented by the Karnaugh map given above?

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

13. What is the binary **equivalent** to 13.125_{10} ?

(1) 1100.001_2 (2) 1100.100_2 (3) 1101.001_2 (4) 1101.100_2 (5) 1101.101_2

14. Which of the following statements about **two's complement** is / are true?

A - All positive and negative numbers start at 0 and 1 respectively
B - Subtraction is performed like addition
C - Widely used in Arithmetic Logic Unit

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

[*see page no. 4*

15. Which of the folloowing(s) is / are **equivalent** to $(P + \bar{Q} + \bar{R}).(P + \bar{Q}R)$?

A - $\left(P + \overline{Q}\right).(P + Q)$
B - $P.(\overline{Q} + R)$
C - $P + \overline{Q}R$

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

16. Which of the following is considered to be the **waiting time** in the operating system?
(1) Total time of blocked and waiting queues
(2) Total time spent in ready queue
(3) Total time spent in running queue
(4) Total time from submission to completion of a process
(5) Total time spent on computer bootup

17. "A program executed by a computer is called a process".
Which of the following is a **normal state of transitions** of such a process?
(1) New → ready → running → terminated
(2) New → blocked → terminated
(3) New → ready → blocked → running → terminated
(4) New → running → ready → running → terminated
(5) New → blocked → ready → running → terminated

18. The operating system uses various ways to make allocations for files.
"Among them …….. creates a **table of pointers** at the time the file is created".
Which of the following is **suitable** for filling the blank?
(1) Linked allocation
(2) Memory allocation
(3) Contiguous allocation
(4) Indexed allocation
(5) Hardware allocation

19. In operating system, "……. is a memory management technique that stores and retrieves data from secondary storage in blocks of the same size for use in main memory". Which of the following is **suitable** to fill the blank?
(1) Swapping
(2) Scheduling
(3) Processing
(4) Paging
(5) Context switch

[*see page no. 5*

20. What is **a page table** in an operating system?
(1) It is a component of arithmetic logic unit found in central processing unit
(2) It is a data structure that stores the pages found in main memory
(3) A data structure that maps the virtual address of the process pages to the physical address.
(4) It is a hardware component found in all memories
(5) Another name of the random access memory

21. Which of the following information is **not generally available** in the Process Control Block (PCB) of an operating system?
(1) Process number
(2) Capacity of harddisk
(3) Scheduling state
(4) Program counter
(5) Process state

22. Consider the following statements about **fiber optic cables**.
A - It has very lower attenuation
B - Its data transfer rate is higher than other copper cables
C - It has higher immunity to electromagnetic interference
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

23. Which of the following(s) is / are **correct**?
A - MAC addresses consist of six bytes length
B - 00-B0-D0-63-C2-26 is an example for MAC address
C - The first half of the MAC address contains the NIC manufacturer's identification number while the second half represents the serial number assigned to the NIC by the manufacturer
(1) A only (2) B only (3) B,C only (4) A,C only (5) A,B,C all

24. Which of the following layer consists of **two sub layers** in an OSI network reference model?
(1) Physical layer
(2) Application layer
(3) Data link layer
(4) Network layer
(5) Presentation layer

25. What is the correct order of **data encapsulation** in computer network?
(1) Frame, bit, packet, segment, data
(2) Bit, segment, frame, packet, data
(3) Bit, frame, packet, segment, data
(4) Packet, frame, bit, segment, data
(5) Data, packet, bit, frame, segment

[*see page no. 6*

26. Consider the IP address 192.147.1.0/29. How many bits are required to identify the **network** and the **host** respectively?

(1) 29, 3 (2) 28, 3 (3) 30, 2 (4) 28, 4 (5) 29, 4

27. Consider the following table.

Label	Characteristics
A	Reliable
B	Connection-oriented
C	Unordered messages
D	Less overhead

Which of the above is /are the characteristic(s) of **TCP**?

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

28. Which of the following is a **correct** statement about data **encryption**?

(1) It is the process by which each party correctly identifies the parties involved in the communication
(2) In secret key encryption, two different keys are used to encrypt and decrypt the data
(3) In public key cryptography, each public party is provided with a unique set of keys to encrypt data
(4) Private key cryptography is more practical than public key cryptography
(5) The reverse usage of the keys of public key encryption enables digital signatures

29. Which of the following can be changed using the **frequency modulation** technology?

(1) Amplitude and frequency only
(2) Amplitude, frequency and phase only
(3) Amplitude and phase only
(4) Frequency only
(5) Frequency and phase only

30. Which of the following statements about computer malware is / are **correct**?

A - A computer virus that replicates itself and spreads from one computer to another
B - Trojan horse appears useful to the user before it is installed on the computer but steals useful information after it is installed.
C - A computer worm that replicates itself and uses a computer network to spread from one computer to another without user intervention.

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

[*see page no. 7*

31. Consider the following statements.

A - Reducing network congestion
B - Simplifying network management
C - Improving network performance
D - Improving network security

Which of the following(s) is / are the **advantage(s)** of subnetting a computer network?

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

32. Consider the following table consisting of software process models in column X and explaining them in column Y.

	Column X		**Column Y**
(i)	Waterfall model	**(a)**	It is more focused for a system with requirements that have the risk of changing.
(ii)	Prototyping model	**(b)**	It is suitable for a project with new business engaged with stable requirements.
(iii)	Spiral model	**(c)**	The initial version of software is first developed, tested, and refined as per user feedback repeatedly till a final acceptable software is achieved.
(iv)	Agile model	**(d)**	It is characterized by a set of clearly defined milestones and deliverables.
(v)	RAD model	**(e)**	It refers to a software development approach based on iterative development and this method break tasks into smaller iterations with time slices.

Which of the following is **correct** pair?

(1) (i) → (a), (ii) → (c), (iii) → (d), (iv) → (e), (v) → (b)
(2) (i) → (c), (ii) → (b), (iii) → (a), (iv) → (e), (v) → (d)
(3) (i) → (d), (ii) → (c), (iii) → (a), (iv) → (b), (v) → (e)
(4) (i) → (d), (ii) → (c), (iii) → (a), (iv) → (e), (v) → (b)
(5) (i) → (a), (ii) → (b), (iii) → (c), (iv) → (d), (v) → (e)

33. Which of the following provides the **best option** for meeting a specific set of requirements for a scalable and secured information system?

(1) Using of open source software
(2) Developing of custom software
(3) Purchasing of commercial off the shelf (COTS) software
(4) Copying from a friend
(5) Obtaining software from service providers

[*see page no. 8*

34. Below are the steps for software testing.

A - Determining of expected result
B - Comparing of actual output with expected result
C - Determining the functionality to be tested
D - Conducting the test

Which is the **correct order** of the above statements?

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

35. Consider the given table below.

	Information Systems		**Description**
(i)	Executive Support Systems	**(a)**	A system which uses knowledge to solve complicated problems in a logical manner.
(ii)	Decision Support System	**(b)**	An Information System that compiles data and analysis models, or provides the administrative staff with analysis tools, makes the semi-structures and structured decisions of an organization.
(iii)	Expert System	**(c)**	information system that addresses unstructured decision making through advanced graphics and communications for the strategic level users of an organization.

Which of the below given is **correct** about the table?

(1) (i) → (a), (ii) → (b), (iii) → (c)
(2) (i) → (b), (ii) → (a), (iii) → (c)
(3) (i) → (b), (ii) → (c), (iii) → (a)
(4) (i) → (a), (ii) → (c), (iii) → (b)
(5) (i) → (c), (ii) → (b), (iii) → (a)

36. Consider the following statements about system **deployment**.

A - A small group of users within an organization using a new system before wider use is a pilot deployment
B - Parallel deployment is an implementation in which small parts of the new system gradually replace small parts of the old system
C - Parallel deployment is more risky as compared to direct deployment

Which of the above is /are **false**?

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

37. Which of the following may be a **functional requirement** of a school student management system?

(1) Being able to log into the system by registered students
(2) Computer user interfaces should be simple to avoid confusion
(3) The system should be able to handle 100 student requests per second
(4) System should be available 24/7 to all students
(5) The system should be accurate enough to provide correct details about students

[*see page no. 9*

38. Which of the following SQL command is data definition language (**DDL**)?

(1) select (2) create (3) update (4) delete (5) insert

39. Consider the following incomplete sentence with a blank.

"…….. attribute is used to derive the value of one attribute from the value of another attribute".

Which of the following is **suitable** for filling the blank?

(1) Composite
(2) Simple
(3) Single-valued
(4) Multi-valued
(5) Derived

40. Consider the following relational database table.

Employee

EmpID	**Name**	**Address**	**Salary**
E001	K. Raj	Jaffna	75000
E002	A.R. Alwis	Galle	60000
E003	W.M.N. Perera	Kandy	80000

Which of the following SQL statement is used to **change** the table's field 'Salary' to 'BasicSalary'?

(1) alter table Employee change Salary BasicSalary float(8);
(2) alter table Employee Salary change BasicSalary float(8);
(3) alter table Employee add Salary BasicSalary float(8);
(4) alter table Employee Salary BasicSalary float(8);
(5) alter table Employee insert Salary BasicSalary float(8);

41. The SQL to create *Customers* table is given below.

CREATE TABLE *Customers* (Name VARCHAR(50) PRIMARY KEY, Payment INT CHECK (Payment <= 40,000));

Table consists of three records initially.

Name	**Payment**
Anupa	10000
Isuru	20000
Roshan	30000

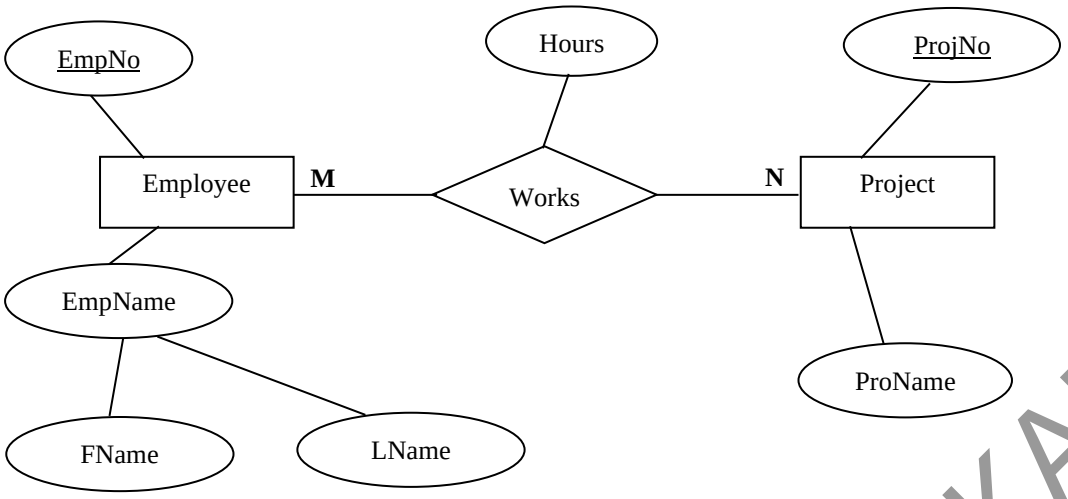
If the following SQL statements are successively applied to the above table, what will be the **total Payment** at the end?

(i) INSERT INTO Customers VALUES ('Oshan', 12000);
(ii) UPDATE Customers SET Payment = 50000 WHERE Name = 'Roshan';
(iii) INSERT INTO Customers VALUES ('Anuradha', 13000);
(iv) DELETE FROM Customers WHERE Name = 'Isuru';

(1) 52000 (2) 62000 (3) 62500 (4) 72000 (5) 85000

[*see page no. 10*

42. Consider the following ER diagram.



Which of the following **realtions** are available when the above ER diagram is mapped to the relational model?

A - Employee (EmpNo, FName, LName)
B - Employee (EmpNo, EmpName)
C - Project (ProjNo, ProjName)
D - Works (EmpNo, ProjNo, Hours)

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

43. Consider the following statements about the mapping of entities to relations in an ER diagram with many-to-many (M:N) relationships.

A - When a new relation is created, the primary keys of the entities are copied to the new relation to act as foreign keys.
B - Attributes of the relationship will be abandoned
C - A new relation is created. The primary keys of the entities are combined to form the primary key of the new relation.

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

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

44. Followings are three major steps involved in designing a new database.

I - Creating a logical design that can be expressed in a data model implemented in DBMS
II - Conducting requirements specifications and analysis
III - Creating a physical design that provides additional specifications for storing and accessing the database

Which of the following answers shows the **correct order** in designing a new database?

(1) II, I, III (2) II, III, I (3) I, II, III (4) I, III, II (5) III, II, I

45. Consider *Lecturer* (LecId, NIC, Lname, Address, Salary) data table.

Consider the following functional dependencies.

Lecid → NIC, Lname, Address, Salary
NIC → Lecid, Lname, Address, Salary

Which of the following is **correct** regarding *Lecturer* table?

[*see page no. 11*

(1) It is in 0 NF
(2) It is in 1 NF
(3) It is in 2 NF
(4) It is in 3 NF
(5) It is in BCNF

46. Consider the following statements about the extended entity relationship (EER) model.
A - EER model consists of all the concepts in ER model
B – In EER, additional concepts such as specialization and generalization are available
C - New concepts are avalable in EER to model weak entities
Which of the above statements are **correct**?
(1) A only (2) B,C only (3) A,B only (4) A,C only (5) A,B,C all

47. What is the **output** of the Python statement 6>>5^3 ?
(1) 1 (2) 2 (3) 3 (4) 4 (5) 5

48. Consider the following statements in regards to computer programming
A - Python is an object-oriented programming language.
B - First and second generation programming languages are collectively called as " High-level programming languages."
C - Compiler translates one instruction at a time from source code to machine code
Which of the above is/are **correct**?
(1) A only (2) B only (3) C only (4) A,B only (5) A,B,C all

49. Which of the following is a **valid** Python identifier?
(1) a_b (2) ab (3) a-b (4) _a_b_ (5) for

50. Consider the following Python statement.

print (4*2+8/2-1+3**2)

In the following table, which is the **order of precedence** of operators in the evaluation from left to right?

(1)	*	/	**	+	-	+
(2)	**	/	*	+	+	-
(3)	**	*	/	+	-	+
(4)	+	-	+	/	*	**
(5)	-	+	+	*	**	/

**

[*End.*

AL/2024/20/E-II

National Field Work Center, Conducting

G.C.E. (Advanced Level) Examination – 2024, Term - 4

Information & Communication Technology [ICT]

தகவல், தொடர்பாடல் தொழினுட்பவியல் II Information & Communication Technology II	20	E	II

மூன்று மணித்தியாலம் Three hours	மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள் Additional Reading Time - 10 minutes

Use the additional reading time to read the question paper and select and organize questions to prioritize when writing the answer.

Index No :.....

- This paper comprises of two parts **A and B.** The time allotted for the **two parts** is **three hours only**. Additional Reading time – 10 minutes.
- Use of calculators is **not** allowed**.**

❑ **Part A – Structured Essay**

- Answer **all** the questions on the question paper itself.
- Write your answers in the space provided for each question.
- Please note that the space provided is sufficient for the answer and extensive answers are not expected.

❑ **Part B – Essay**

- This part consists of **six** questions. Answer **four** questions only. Use the papers supplied for this purpose.
- At the end of the time allotted for this paper, tie the **two papers together** so that **Part A** is **on top** of **Part B** and hand them over to the Supervisor.
- You are permitted to remove **only Part B** of the question paper from the Examination Hall.

For Examiner's Use Only

Part	Question No.	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9	
	10	
Total		
Percentage		

Final Marks

In numbers	
In words	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Checked by	
Supervised by	

[see page no. 2

Part A – Structured Essay

*Answer **all four** questions on this **paper itself**.*

Do not write in this column

1.

(a) Write the three steps of the fetch-execute cycle.

……

……

……

(b) Give any two advantages of cloud computing.

……

……

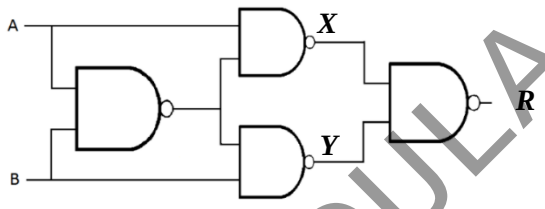
(c) Compute 20_{10} - 13_{10} using 8-bits two's complement method.

……

……

……

(d) Consider the following logic gate.



(i) Fill in the columns of the following truth table appropriately for the above logic circuit.

A	B	X	Y	R
0	0			
0	1			
1	0			
1	1			

(ii) Which basic logic gate is equivalent to the above logic circuit?

……

(e) Write down two advantages that users get from open source software compared to proprietary software.

……

……

[see page no. 3

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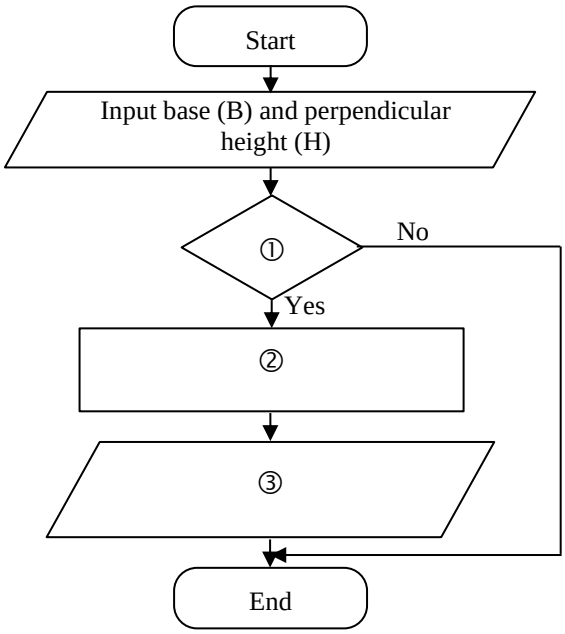
2.

(a) Consider the following incomplete flowchart for inputting the base and perpendicular height of a triangle and displaying its area as output.
The flowchart should stop when the base and perpendicular height are zero or negative values.
Area = ½ x base x perpendicular height.



Fill in the blanks in the flowchart as appropriate.

① ……..

② ……..

③ ……..

(b) Fill in the blanks appropriately using the words and phrases given in the list below (just write the appropriate digits).

(i) The system's services, constraints and goals are developed in ……. with the consultation of the end users ……..
(ii) ……. requirements are systematically translated by software tools as an executable software representation.
(iii) …….. is one that generates a set of programs realized as software design.
(iv) …….. ensures that the system functions properly and meets specific user requirements.
(v) In the state of …….. the bugs in the system should be corrected and the system should be modified and optimized according to the new user requirements.

Lists : [① - Maintenance, ② - Implementation, ③ - Requirements analysis, ④ - Testing, ⑤ - Design]

[see page no. 4

Do not write in this column

(c) Assume that a block of a file at link allocation uses 124 bytes but practically 500 bytes are required for four blocks. Briefly explain why this happens.

……

……

……

3.

(a) Fill in the blanks appropriately in the table below.

OSI model	TCP/IP model
Application layer	F
A	
B	
C	G
Network layer	H
D	
E	Network access layer

A …….

B …….

C …….

D …….

E …….

F …….

G …….

H …….

(b) Consider the following statements about data communication and computer networks. Choose the appropriate words to fill in the blanks from the list given below.

(i) …… saves IP addresses by operating private IP networks using unregistered IP addresses for Internet use.

(ii) …….. is a network security device that monitors and filters network traffic in and out of an organization based on predetermined security policies.

(iii) …….. is a social engineering attack used to steal user data such as login credentials and credit card numbers by masquerading as a trusted entity.

(iv) ……. is a malware that encrypts the victim's information and demands money as a question to provide it.

[see page no. 5

Do not write in this column

(v) ……. is a technology that allows multiple communication signals to be joined together to pass through a signal communication medium simultaneously.

[**Lists:** DNS, Phishing, FTP, Ransomware, ALOHA, Ethernet, Firewall, Router, Trojan horse, NAT, Multiplexing, UDP]

(c) The data 10101001 sent by a machine A is received as 11101101 by machine B. Can machine B find this error using the odd parity method? Also satate the reason for it.

……

……

……

4.

(a) Write down two advantages of electronic database.

……

……

……

(b) Consider the following scenario.

In a distribution company, each driver can drive any vehicle and each vehicle can be driven by any driver. The following database table records the distance traveled by each driver.

DriverID	VanID	DriverName	VanMake	Mileage
D01	*V03*	*Selvam*	*Ford*	*350*
D02	*V01*	*Silva*	*Mercedes*	*800*
D01	*V01*	*Selvam*	*Mercedes*	*200*

(i) Give an example of an insertion anomaly that can take place in this table.

……

……

……

(ii) Explain what is meant by partial dependency in relation to this table.

……

……

……

[see page no. 6

Do not write in this column

(iii) After removing the partial dependencies, convert the table to the next normal form.

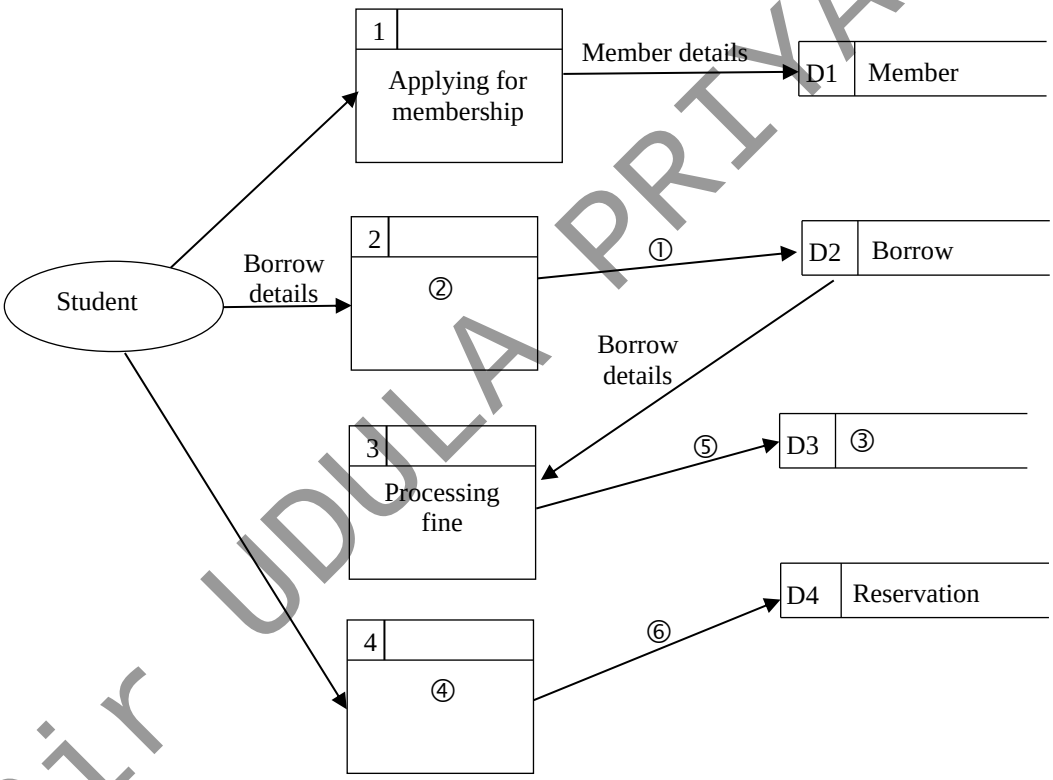
……

……

……

(c) Consider the following first level dataflow diagram (DFD).

Students apply for membership in a library. That information will be added to the membership file. Each member can get three books fortnightly. Those details will be added to the borrow file. After that, if the books are not returned in time, the corresponding fine payment will be levied. That information will be included in the fine file. A library may have more than one copy of a book. Fine varies according to the number of additional days. Books can be reserved by members. This information will be kept for one week. This information will be added to the reservation file.



Fill in the blanks using suitable phrases.

① ……

② ……

③ ……

④ ……

⑤ ……

⑥ ……

**

[see page no. 7

National Field Work Center,

Conducting

G.C.E. (Advanced Level) Examination - 2024 , Term - 4

Information & Communication Technology [ICT]

தகவல், தொடர்பாடல் தொழினுட்பவியல் II
Information & Communication Technology II

20	E	II

Part B

❋ Write down four questions only.

(5)

(a) Consider the following Boolean expression.

$\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + AB\bar{C} + A\bar{B}\bar{C} + A\bar{B}C$

(i) Complete the following Karnaugh map.

C \ AB	00	01	11	10
0				
1				

(ii) Simplify the Boolean expression in sum-of-products (SOP) form using the Karnaugh map given in **(i)** above. Show loops clearly.

(iii) Simplify the Boolean expression in product-of-sums (POS) form using the Karnaugh map given in **(i)** above. Show loops clearly.

(iv) State, with suitable justification, the least expensive implementation of this logic circuit using the simplifications obtained in **(ii)** and **(iii)** above.

(6)

(a) A manufacturing company has four local area networks (LANs) for each of its departments, such as business information systems, accounting, production, and marketing. The four departments namely business information system, accounting, production and marketing have 38, 25, 27, 34 computers and 1, 2, 1, 2 network printers respectively.

An IP block 192.147.1.0/24 is assigned to the network administrator. The network administrator must assign IP addresses to all the nodes in each department. Four subnets will be set up for this purpose and this network will be connected to a public IP address for th Internet access of employees. Each department is located in a different building in an area. A firewall is installed for the security of the network and four switches, necessary network cables, a proxy server and a DHCP server are provided to the network administrator for this purpose. The business information dystem department is directly connected to the Internet.

Draw a network diagram for this scenario. Show all IP addresses, network connectivity devices and servers. Use the following table as a guide to assign IP addresses.

[see page no. 8

Note: Use fixed length subnet mask (FLSM) method only for this purpose.

Departments	Network address	Broadcast address	Subnet mask	Usable IP address range
Business information systems				
Accounting				
Production				
Marketing				

(b) Write down two benefits of using fixed length subnet mask (FLSM) in **(a)** above.

(c) Answer the following questions.

(i) Write down a major function of a proxy server.

(ii) Write down two services of the network layer in OSI network reference model.

(iii) Write down two major functions of router.

(7)

(a) Scenario of a book stock management system is given below.

Books are written by authors and published by the publishers. A book may be written by one or more authors and an author may write one or more books. Author is uniquely identified by author name and it also contains address and email address. Book is uniquely identified by ISBN. It also consists of year, title, and price. A publisher publishes many books every year. A shopping basket contains a lot of books. Warehouse stocks a lot of books. Customer takes book from shopping basket.Shopping basket is uniquely identified by basketID.

Draw an ER diagram for the book stock management system and state all the assumptions if you made.

(b) The following table consists of particulars of a medical company.

PatientNo	PatientName	TestType	Charge	TreatmentDate
1002	Rajaram	MRI	15000	2/5/2018
1203	Deepika	Blood test	1500	5/2/2108
1401	Alwis	Urine test	2000	6/2/2018
1002	Rajaram	Blood test	1500	7/3/2018
1002	Rajaram	ECG	4500	4/7/2018
1002	Rajaram	X-Ray	7000	1/2/2018
1203	Deepika	Blood test	1500	3/5/2018

(i) In a relational database table, write down the condition for third normal form.

(ii) Convert the table given above to third normal form (3NF).

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(c) Consider the following "EMPLOYEE" data table.

EmpNo	EmpName	Position	Department	BasicSalary
e_01	Raj	FC	Finance	87000
e_02	Hakeem	MA	Finance	50000
e_03	Ratnayake	AccClerk	Accounting	55000
e_04	Kayathiri	Manager	Marketing	90000

Write down SQL statements for the following requirements given below.

(i) Adding a new record details with data of e_05, Rajaratnam, SysEng, IT,120000 for a new employee (data are given in order of attributes)

(ii) Obtaining details of all the employees who gets Rs. 60000 or above as Basic Salary

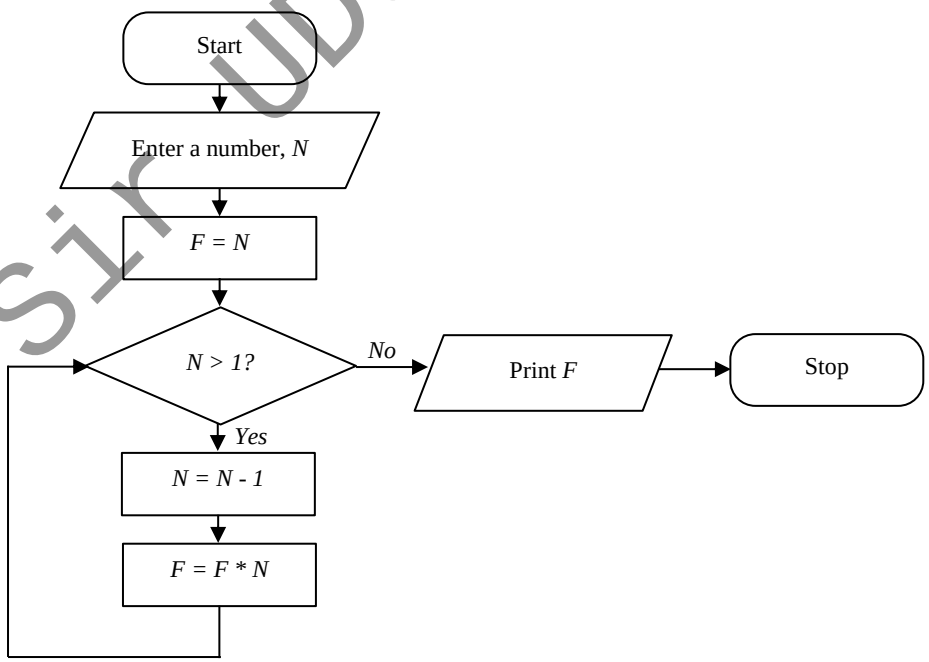
(iii) Obtaining department name, number of employees in each department and total Basic Salary department wise.

(8)

(a) A company which provides parcels delivery services through postal service is to be calculated total charge for parcels according to the charge for different range of parcels weight given below in the table. Total charge as output is to be calculated by obtaining parcels weight from user. One weight should be entered at a time and calculations should be done for a number of weights. Its number should be obtained first. Draw flowchart for this scenario.

Range of parcels weight	From 1 to 5 kilo gram	From 6 to 10 kilo gram	More than 10 kilo gram
Charge	Fixed rate: 100/=	50/= per kilo gram	70/= per kilo gram

(b) Consider the following flowchart that represents an algorithm.



[see page no. 10]

(i) What will be the output of this flowchart if the value 5 is entered by the user?
(ii) Write down the purpose of this algorithm.

(c) Briefly explain why the program translators are needed to execute the programs written in high level computer programming languages.

(9)

(a) Explain what is process control block (PCB) in an operating system and write down any two data that the process control block may contain.
(b) Consider a program with 32 KB running on a computer with 32 KB of physical memory. The page size of the block is 4 KB. Virtual memory is 64 KB. Below is the page table of this process in a given time.

Page no.	Frame no.	Present / absent
0	101	1
1	001	1
2	010	1
3	100	1
4	011	1
5	000	0
6	000	0
7	101	1

Note:

- Only a few fields are shown for each record in the page table.
- Frame number is shown in binary.
- The virtual addresses on page 0 are from 0 to 4095 while the virtual addresses on page 1 are from 4096 to 8191.
- Present / absent indicates the record is valid. This bit 1 can be used while the record is still valid. Bit 0 means that the corresponding virtual page is not in physical memory

(i) Calculate the number of pages.
(ii) How many bits are required to store one page number?
(iii) How many bits are required to store one frame number?
(iv) How many bits is the virtual memory offset?
(v) Write one advantage of using a page table compared to physical memory size with respect to program size.
(vi) Write down one reason why a particular page belonging to a process is not in physical memory.

(c) Write down any two advantages of continuous allocation method used in an operating system.
(d) Write down the steps involved in the context switch in an operating system.

(10)

(a) Compare and contrast black box testing and white box testing (two comparisons are sufficient).
(b) Consider the following scenario.

A popular library in the city uses a library management system. Some of the functional and non-functional requirements of this system are given below.

[see page no. 11

(A) Information about the members should be able to be recorded in the library.
(B) The system should be able to retrieve information about the members (name, phone number, age, date of admission, address) in reports.
(C) The system should be available 99.9 %.
(D) The user interface of the system should be easy for library members to use after a very short training.
(E) The members should be able to record the details of the books while members borrowing the books.
(F) The librarian should be able to obtain a report of the status of the books borrowed from the library.
(G) The system should be capable of facilitating at least 1000 users simultaneously using it over the network.
(H) The system should be able to perform data backup every day in an efficient manner.

Classify and write the above functional and non-functional requirements separately. (Just writing their labels is enough).

(c) Explain the two drawbacks of the waterfall model in software development.

***

[end.