



General Certificate of Education (Adv. Level) Examination
Fourth Term - 2022
 Conducted by Field Work Center (FWC), Thondaimanaru
Information & Communication Technology (ICT)

தகவல், தொடர்பாடல் தொழினுட்பவியல் I
 Information & Communication Technology I

Two Hours

20

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I

Gr. 13 (2022)

Part - 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. What is it called to deceive computer users by sending them emails as if they were sent from trusted companies and steal valuable information like their credit card number and password?
 - (1) Plagiarism
 - (2) Piracy
 - (3) Digital divide
 - (4) Privacy
 - (5) Phishing
2. Which of the following sets of computer memory and secondary devices gives the ascending order of their capacity from left to right?
 - (1) SSD → Cache memory → RAM → Register
 - (2) RAM → Cache memory → Register → SSD
 - (3) Register → Cache memory → RAM → SSD
 - (4) Register → RAM → Cache memory → SSD
 - (5) Register → SSD → RAM → Cache memory
3. Consider the following statements about the evolution of computers.

A - Power consumption and size of computers have increased

B - Computers' power consumption has increased while their size has decreased

C - Computers' processing speed has increased while their size has decreased

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

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

4. Which of the following is the best example for online processing?

- (1) Payroll preparation system
- (2) Depositing cash in automated teller machine (ATM)
- (3) Electricity utility bill preparation system
- (4) Telecommunication bill preparation system
- (5) Water utility bill preparation system

5. Consider the following statements.

A - Providing privately stored patient details stored on a computer to an insurance company without the patient's knowledge is an act of violating on a patient's personal data

B - Software piracy is of copying and providing a copy of a licensed software to another without permission

C - Copying and selling a book without the permission of its publisher is an act that violates the laws of intellectual property

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

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

6. Consider the following statements.

A - DRAM technology is used in register

B - SRAM technology is more fast than DRAM technology

C - Cache memory is made of SRAM technology

Which of the above is /are correct?

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

7. Which of the following is /are the step(s) of fetch-execute cycle of a central processing unit?

A - Control unit fetches next instructions from main memory

B - All the instructions are decoded

C - Arithmetic logic unit executes the instructions

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

8. $14.625_{10} =$

- (1) 1110.01_2
- (2) 1001.011_2
- (3) 1001.001_2
- (4) 1101.10_2
- (5) 1110.101_2

9. Which of the following is /are equivalent to BCA_{16} ?

A - 5357_8

B - 101011101111_2

C - 2700_{10}

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

10. Which of the following is two's complement of $(-38)_{10}$?

- (1) 11011110_2
- (2) 11011010_2
- (3) 10011010_2
- (4) 11001010_2
- (5) 11010000_2

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

I - $A.B + C$

II - $AC + BC$

III - $A.\overline{B} + C$

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

12. Consider the following statements.

A - Latches and flip-flops are the basic components to store data

B - SR flip-flop consists of two outputs and one of that is the reverse or complement of another and has two inputs

C - SR flip-flop can be designed with the help of two NOR gates or two NAND gates

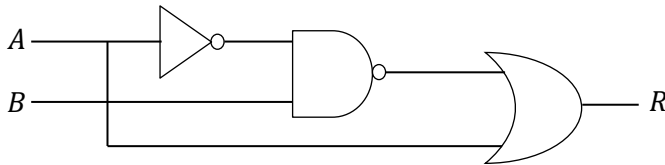
Which of the above is /are correct?

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

13. What will be the result of bitwise NOR operation of the binary numbers 10100110_2 and 01011101_2 ?

- (1) 00000000_2 (2) 00000100_2 (3) 10000110_2 (4) 10000010_2 (5) 11000010_2

14. Consider the following logic circuit.



Which of the following Boolean expression(s) is /are equivalent to the output R of this logic circuit?

A - $\overline{(\overline{A} \cdot B)} + A$

B - $(\overline{A} + B) + \overline{B}$

C - $A + \overline{B}$

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

15. Consider the following Karnaugh map.

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

Which of the following Boolean expression is given by this Karnaugh map?

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

16. Consider the following statements about operating system.

A - Allocating memory required for processes

B - Resolving memory allocated for processes

C - Creating files and folders

D - Creating processes

Which of the above is /are the function(s) of file management in an operating system?

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

17. Consider the following characteristics used to allocate spaces for files in operating system.

A - No external fragmentation

B - Each data block is stored contiguously

C - It is necessary to know the file size in advance at the time of creation of the file

Which of the above is /are the characteristic(s) of indexed allocation?

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

- 25.** Which of the following is correct about data encryption?
- (1) It is the process of correctly identifying the parties involved in a communication by each party
 - (2) In secret key encryption, two different keys are used to encrypt and decrypt data
 - (3) In public key cryptography, each public party is given a separate key to encrypt data
 - (4) Private key cryptography is more practical than public key cryptography
 - (5) Reversed usage of keys in public key encryption enables digital signature
- 26.** Consider the IP address 192.10.15.1 /27. How many bits are required to identify network and host respectively?
- (1) 24, 8
 - (2) 28, 3
 - (3) 8, 24
 - (4) 28, 4
 - (5) 27, 5
- 27.** Which of the following is a valid subnet mask?
- (1) 255.255.255.192
 - (2) 0.0.0.255
 - (3) 0.0.255.255
 - (4) 0.10.0.255
 - (5) 0.255.256.0
- 28.** “..... is a network topology that allows all data through a central hub”.
- (1) Star
 - (2) Ring
 - (3) Mesh
 - (4) Bus
 - (5) Server
- 29.** Which of the following statement is true about the URL <http://www.books.com/index.html>?
- (1) Top level domain is books.com
 - (2) www.books.com is a protocol
 - (3) www is a service of the Internet
 - (4) html is a protocol
 - (5) Top level domain is www.books.com
- 30.** In computer networks, which of the following is /are correct about UDP?
- A - Reliable data transfer
 B - Connectionless
 C - Guaranteed delivery
- (1) A only
 - (2) B only
 - (3) A,B only
 - (4) B,C only
 - (5) A,B,C all
- 31.** Which of the following would be functional requirement of a students information system for a private tuition institute?
- (1) System should have user-friendly interfaces
 - (2) Teachers should be able to evaluate online tests
 - (3) Students should be able to edit the teaching materials
 - (4) System should withstand user errors
 - (5) Student login has to be expired after one year
- 32.** Which of the following is incorrect statement about off-the-shelf software in comparison with custom software?
- (1) Software is designed to the exact user’s requirements
 - (2) Changes or maintenance can be made quickly
 - (3) More reliable because off-the-shelf software is well tested before its been sold
 - (4) Less expensive comparably
 - (5) Too many features, most are not used by users

33. Consider the following statements about software process models.

- It is an incremental software development process model
- It iterates very short period software development
- Software modules are developed in parallel and they are integrated in order to deliver software to user speedily.

Which of the following software model satisfies the above statements?

- (1) Waterfall model
- (2) Rapid application development (RAD) model
- (3) Spiral model
- (4) Object-oriented model
- (5) Agile process model

34. Consider the following statements.

- A - An external entity can be directly connected to data store
B - An external entity can be connected through a process to data store
C - A data store can be directly connected to data store

Which of the above is /are correct regarding DFD by using SSADM?

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

35. Consider the following statements.

- A - Human nervous system is a closed system
B - General purpose computer is an open system
C - School is a closed system
D - Human blood circulatory system is a closed system

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

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

36. Which of the following(s) is /are considered as data gathering techniques during software development?

- A - Spiral
B - Onsite observation
C - Discussions
D - Questionnaires
E - Waterfall

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

37. By whom is the user acceptance testing carried out?

- (1) It is carried out by software developers
- (2) It is carried out by software engineers
- (3) It is carried out by system analysts
- (4) It is carried out by software designers
- (5) It is carried out by end users with the help of software developers

38. Consider the following statements about software development.

- A - Providing training about software required for users
- B - Correcting bugs (errors) available in software
- C - Identifying user requirements and limitations of the current system

Which of the above is /are related to system analysis phase?

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

39. In a relational database model, number of records and number of attributes of a table are

....., respectively.

- (1) Cardinality, domain
- (2) Degree, cardinality
- (3) Domain, degree
- (4) Cardinality, degree
- (5) Domain, cardinality

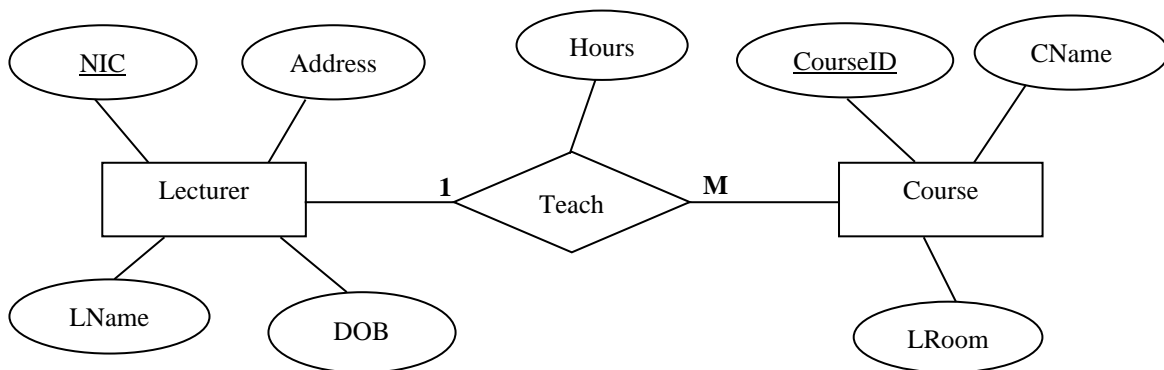
40. Consider the following statements about relational database primary key.

- A - A table must have a primary key
- B - A table must have a primary key must be in first column of a table
- C - A table can have more than one primary key

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

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

41. Consider the following ER diagram.



Which of the following relation(s) is /are obtained if the above ER diagram is mapped into relational model?

- A - Lecturer (NIC, LName, DOB, Address)
- B - Lecturer (NIC, LName, DOB, Address, CourseID)
- C - Teach (NIC, CourseID, Hours)
- D - Course (CourseID, CName, LRoom, Hours, NIC)

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

42. Consider the following relation.

Customer (Customer_no, Customer_name, Address, Phone_no)

Where, Customer_no is a unique attribute and Phone_no takes multiple values. If Customer table is converted to first normal form, which of the following tables are correct?

- (1) Customer (Customer_no, Customer_name, Address) மற்றும் Contact (Phone_no)
- (2) Customer (Customer_no, Customer_name, Address) மற்றும் Contact (Customer_no, Phone_no)
- (3) Customer (Customer_no, Customer_name) மற்றும் Contact (Customer_no, Phone_no, Address)
- (4) Customer (Customer_no, Customer_name) மற்றும் Contact (Phone_no, Address)
- (5) Customer (Customer_no, Customer_name) மற்றும் Contact (Address)

43. Which of the following SQL command is the type of DML (Data manipulation Language)?

- (1) drop
- (2) grant
- (3) update
- (4) create
- (5) alter

44. Which of the following SQL can be used to delete the record of a person whose CustomerName is 'Alfred' from 'Customer' data table?

- (1) DELETE FROM Customer WHERE CustomerName='Alfred';
- (2) REMOVE FROM Customer WHERE CustomerName='Alfred';
- (3) DISCARD FROM Customer WHERE CustomerName='Alfred';
- (4) DROP FROM Customer WHERE CustomerName='Alfred';
- (5) DELETE Alfred FROM Customer;

45. What is the value of Python statement $5^3 + 2 * 3 - 4$?

- (1) 7
- (2) 3
- (3) 2
- (4) 18
- (5) 4

46. Which of the following is not a comparison operator in Python programming?

- (1) +
- (2) >
- (3) ==
- (4) <=
- (5) <

47. Which of the following is a valid Python identifier?

- (1) x#y
- (2) x_y
- (3) x-y
- (4) x y
- (5) 2y

48. Consider the following statements.

A - Translators are not necessary to execute Python program in computer

B - Translators are necessary to execute programs written in third generation programming language in computer

C - Translators are not necessary to execute programs written in first generation programming language in computer

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

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

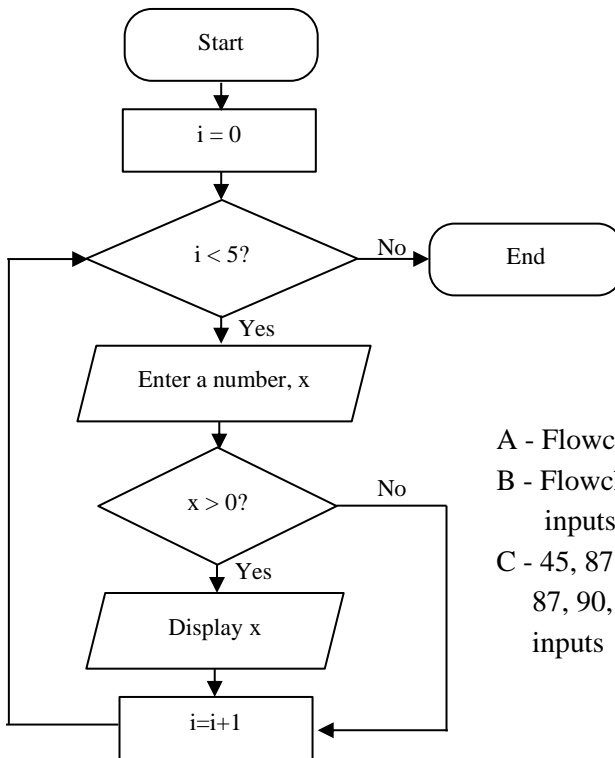
49. Consider the following statements.

- A - Interpreters execute programs in computer after converting the source code into machine code at a time
- B - Compilers execute programs in computer after converting the source code into machine code line by line
- C - Assemblers execute programs in computer after converting the programs written in second generation programming language into machine code

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

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

50. Consider the following statements about flowchart given below.



A - Flowchart obtains five inputs only

B - Flowchart gives only positive numbers from the user inputs as output

C - 45, 87, 90 and 77 are received as output while 45, -32, 87, 90, -67, -55 and 77 are entered one by one as users inputs

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

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

[End



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 Information & Communication Technology II

Three Hours

20

E

II

Gr. 13 (2022)

Part – II A Structured Questions
Answer all four question on this paper itself

1.

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

<u>PersonID</u>	FirstName	LastName	City
P001	John	Joe	Colombo
P002	Perera	Silva	Galle
P003	Jamuna	Sivarasa	Jaffna
P004	Hakeem	Aslum	Kandy
P005	Vimali	Nathan	Jaffna

(i) Write down appropriate SQL statement to create 'Persons' table with primary key.

.....

.....

.....

(ii) Write down required SQL statement to insert the record of person 'P003'.

.....

.....

.....

(iii) Write down the output obtained by applying the SQL statement select PersonID,FirstName,City from Persons where City='Jaffna'; to the table.

.....

.....

.....

.....

.....

.....

(b) The following table shows the details about employees.

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Employees

<u>EmployeeNo</u>	<u>DepartmentNo</u>	<u>EmployeeName</u>	<u>Department</u>
1	101	Amith	HR
2	102	Divya	IT
3	101	Rama	HR

(i) Write down two advantages of converting a database table to a normal form.

.....
.....
.....
.....

(ii) Justify with the appropriate reason which normal form the above data table is.

.....
.....
.....
.....

(iii) Convert the table to the next normal form you said in (ii) above.

.....
.....
.....
.....

2.

(a) Consider the following Pseudocode.

Begin

 Enter a number, *N*

$F = N$

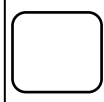
 DO WHILE $N > 1$

$N = N - 1$

$F = F \times N$

 END WHILE

End



(i) If value 4 is entered as input in this Pseudocode, what will be the output?

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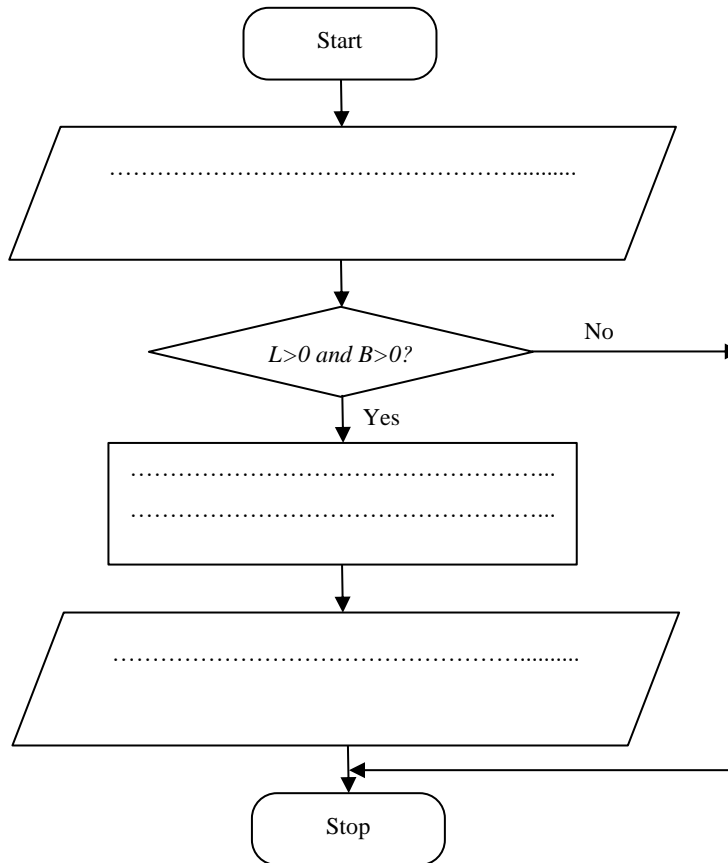
(ii) State the purpose of this Pseudocode briefly.

.....

.....

(b) Consider the following incomplete flowchart to be displayed the perimeter (P) and area (A) of a rectangle while length (L) and breadth (B) are entered as inputs. Only when length and breadth are greater than zero, the perimeter and area should be calculated and their outputs should be displayed.

Where, Perimeter = 2 x (Length + breadth), Area = Length x Breadth.



(c) Briefly explain the purpose of variables in computer programming.

.....

.....

.....



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3.

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

[Lists: Amplitude modulation, Parity bit, Circuit switching, Modem, Medium Access Control (MAC), Bandwidth, Pure ALOHA, Frequency modulation, IP, Slotted ALOHA, Distortion, Packet switching]

- (i) In any broadcast network, the stations must ensure that only one station transmits at a time on the shared communication channel. It is determined by
- (ii) Frequency difference of a data channel is called its
- (iii) Amplitude of carrier signal varies according to the amplitude of modulating signal. The frequency or phase of the carrier signal remains unchanged in
- (iv) is used as the simplest form of error detecting code in which a bit is added to a string of binary code to ensure that the total number of 1-bits in the string is even or odd.
- (v) The user can transmit the data frame whenever the station has the data to be transmitted by using
- (vi) There is a dedicated communication path between two devices (end-to-end). Data are travelling in the same path. This technology is called

(b) Match each phrase given from (i) to (vi) with the most relevant item from the list given below:

Lists : [Software as a service-SaaS, Plagiarism, stealing / phishing, Cloud computing, Platform as a service-PaaS, Infrastructure as a service-IaaS]

Phrases:

- (i) It is a concept of using computer networks including personal computers and mobile devices, to facilitate retrieving and storing information from anywhere at any time.
- (ii) It provides a virtual environment of servers to provide space to store data and software applications.
- (iii) It provides virtual server environment for software development.
- (iv) It provides software installed in cloud without installing the software required by the user.
- (v) 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.
- (vi) It is the acting of usage of one's works and ideas as his / her own.



Write the most relevant phrase in the Items columns in the table given below.

Do not write in this column

No.	Items
(i)	
(ii)	
(iii)	
(iv)	
(v)	
(vi)	

(c) Consider the following steps of types of software testing used in software development. They are not listed in the correct order of software testing sequence.

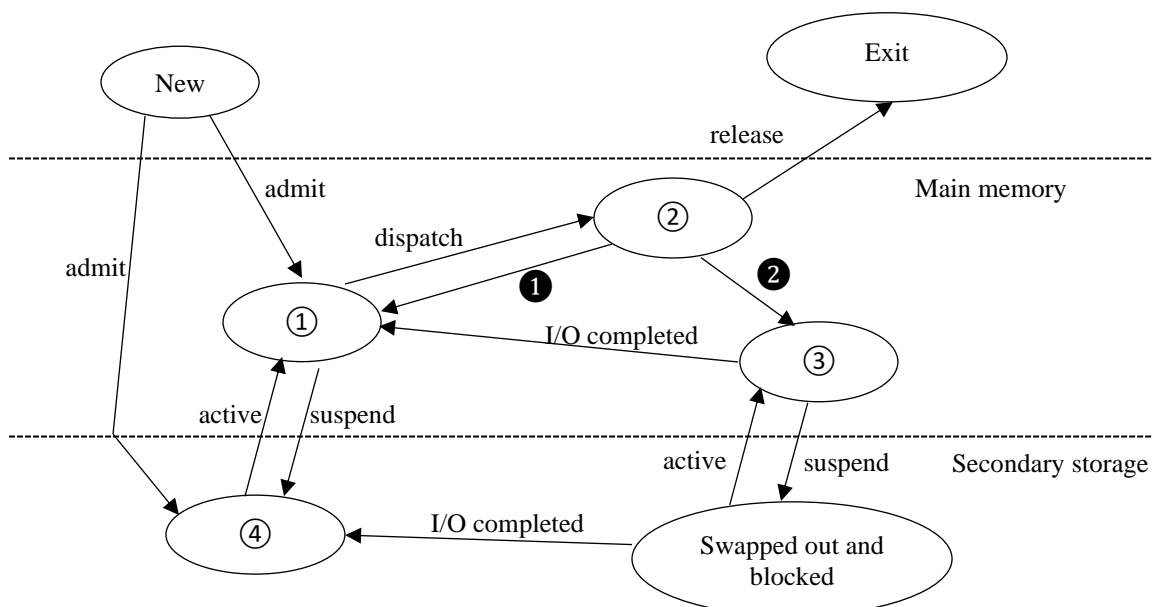
- ① - User acceptance testing
- ② - Unit testing
- ③ - System testing
- ④ - Integration testing

Write down in the correct order of software testing sequence in the space provided below from ① to ④ (write down the labels only).

- 1.....
- 2.....
- 3.....
- 4.....

4.

(a) Consider the following process state transition diagram in an operating system.



(i) Write down appropriate terms for the numbers from ① to ④ in the following table.

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Label	Appropriate terms
①	
②	
③	
④	

(ii) Write down the appropriate term for ❶ in the diagram given above and give a reason for it.

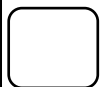
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(iii) Write down the appropriate term for ❷ in the diagram given above and give a reason for it.

.....
.....

(b) Assume that the file uses 124 bytes per block of the file in the linked allocation. But in practice four blocks require 500 bytes. Briefly explain why this happens.

.....
.....





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Information & Communication Technology II

Part - B

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E

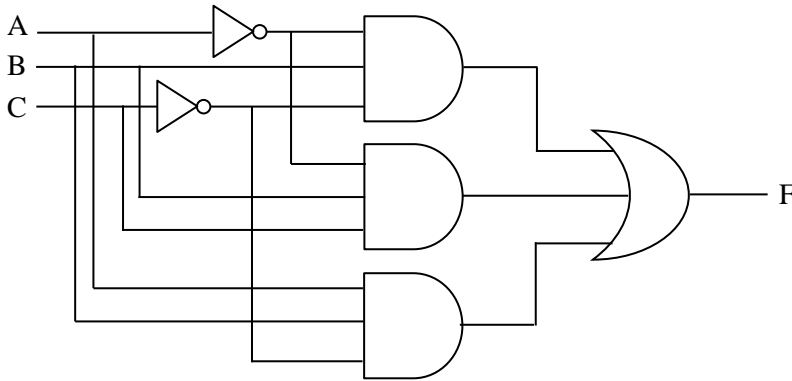
II

Gr. 13 (2022)

Part - II B

Answer any four questions only.

5. Consider the following logic circuit.



- Write down Boolean expression for the output F of the logic circuit given above.
- Construct truth table for the Boolean expression obtained in (a) above.
- Using Karnaugh map, simplify the Boolean expression obtained in (a) above.
- Draw the logic circuit again using NAND logic gates only for the simplified Boolean expression obtained in (c) above.

6. Consider the following scenario.

A company has four local area networks (LANs) for each of its departments such as information systems, sales, finance and marketing. Each department consists of the number of computers as follows in the table given.

Departments	Number of computers in each department
Information systems	12
Sales	19
Finance	13
Marketing	10

An IP block 195.4.3.0/27 is given to the information systems manager /administrator. The information systems manager /administrator is required to allocate IP addresses for all nodes in each department. 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. Each department is situated in different building in an area. Each department has a network printer separately. A firewall is installed for network security and four switches, network cables, proxy server and DHCP server are given to the information systems manager /adminstrator for this purpose. Information systems department is connected directly to the Internet.

Draw a network diagram for this scenario. Show all the IP addresses, network connectivity devices and servers clearly. Use **VLSM (Variable Length Subnet Mask) method only** to allocate IP addresses effectively.

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

Departments	Network address	Broadcast address	Subnet mask	Usable IP address range
Information systems				
Sales				
Finance				
Marketing				

7. A health care company is planning to create a mobile application to indicate Body Mass Index (BMI), so that their patients can work out if they are a healthy weight (Weight - W) for their height (Height - H). The formula used for this calculation is: $BMI = W / H^2$
Where, Height (measured in metres), W = Weight (measured in kg).

- (a) Write a pseudocode to calculate the BMI using the formula given above.
- (b) Draw a flowchart to calculate BMI in which the input variables are H and W, and the outputs such as BMI and Category should be displaed.

The following condional data are used to determine the category.

BMI	Health category
Less than 18.5	Underweight
From18.5 to 25.0	Normal
Greater than 25.0 and up to 30.0	Overweight
Greater than 30.0	Obesity

8. Consider the following scenario.

A School plans to implement a Teachers' Information Management System. The purpose of this system is to identify and manage teachers' responsibilities and tasks. This system uses a database to store the information about teachers, classes and all the subjects.

The registration number, name, contact number, the date of appointment, username, password and job role (whether principal or teacher) should be stored in the system. All the teachers and the principal can access to this system.

All the subjects for each grade should be stored and identified uniquely. subject code, subject name and grade are stored in this system. The teachers are allocated for subjects. Most of the teachers allocated for one subject and there are some cases that a teacher teaches more than one subject. For one particular subject, there can be more than one teacher allocated.

There are four classes for one grade in the school and each classroom can be uniquely identified from the class code and with the class code, the grade, and details of the class teacher should be recorded. One teacher is assigned as teacher in charge for only one class and there is only one teacher in charge for each class.

Construct a single ER diagram for the above mentioned scenario and identify attributes and associate them with entity or relationship types and mark primary key attributes for each entities. State any assumptions necessary to support your design.

9.

(a) Briefly describe the functional requirements and the non-functional requirements in relation to the system.

(b) Consider the following scenario.

A super market chain uses a computer based sales information system. Customers will search for items and reach the sales counter to receive their invoices.

(A) The database should be able to accommodate 100,000 customer records.

(B) Sales assistant shall be able to prepare a sales invoice.

(C) Sales assistant shall be able to search for items and check their prices in the system.

(D) The system should be able to produce a receipt of 10 customers in 5 minutes.

(E) Sales assistants should be able to input the details of the items given by customers into the system.

(F) Sales assistants shall be able to calculate the total cost of the items.

(G) Sales assistants should be able to change the login password immediately that was initially assigned after the first successful login.

(H) The system should be able to load within three seconds of each sales assistant entering the system.

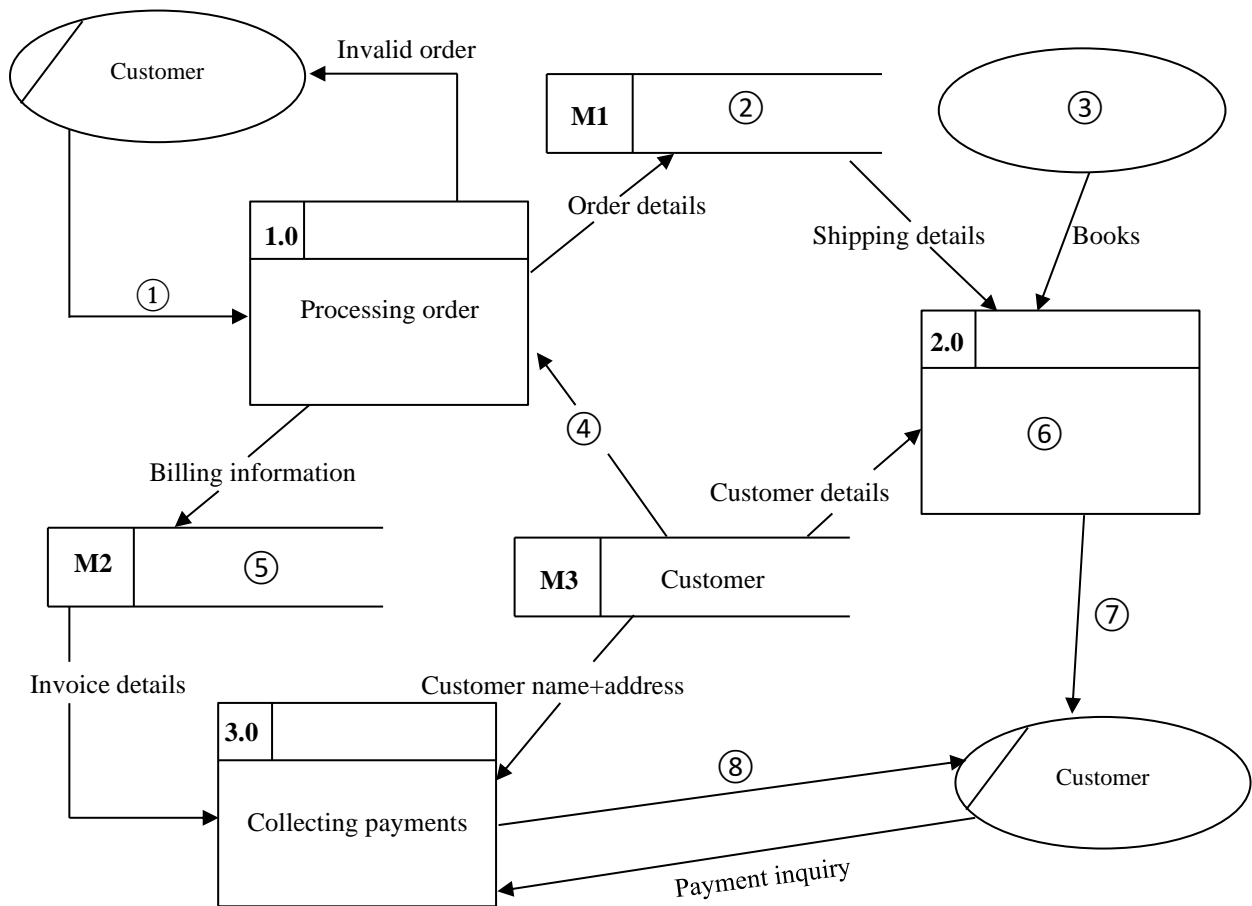
Classify the user requirements of the sales information system into the functional or non-functional requirements mentioned above (it is sufficient to write down only their labels).

(c) Consider the following scenario regarding the order processing system for books carried out by the customers.

Customers will issue orders for books. The details of the order are processed. Order details are sent to the order file. The customer name and address are retrieved from the customer file. The billing details are sent to the invoice file. Invoice details are obtained from the invoice file and

payments are collected. The customer name and address are retrieved from the customer file. The information are sent to the customer if order details are invalid. Shipping details are obtained from the order file and based on this, the process of shipping the books is carried out. Customer details are retrieved from the customer file. As well as books from the warehouse are obtained. The customer will carry out payment inquiry. Invoice statements are sent to the customer. Eventually the books are sent to the customer.

The first level data flow diagram (Level -1 DFD) for the order processing system is given below.



Fill in the blanks using appropriate terms from ① to ⑧.

- ①
- ②
- ③
- ④
- ⑤
- ⑥
- ⑦
- ⑧
