



**General Certificate of Advanced Level Examination**  
**Term – 3, 2022**  
**Conducted by Field Work Center (FWC), Thondaimanaru**  
**Information & Communication Technology (ICT)**

தகவல் தொடர்பாடல் தொழினுட்பவியல் I  
 Information & Communication Technology I

Three hours

Gr. 12 (2022)

20

E

I

**Instructions:**

- ❖ Answer all the 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.

**Part - I**

1. The unit that holds the address of the next instruction to be executed fetching into the central processing unit is called .....  
 (1) Program Counter (PC)  
 (2) Arithmetic Logic Unit (ALU)  
 (3) Control Unit (CU)  
 (4) Register  
 (5) Main memory
2. Consider the following statements.  
 A - It is not necessary to obtain legal permission for the usage of proprietary software from respective owners  
 B - All the open source software are always free of charge  
 C - Open source software give more rights to the users while comparing to proprietary software  
 Which of the above is /are correct?  
 (1) A only                      (2) B only                      (3) C only                      (4) A,C only                      (5) B,C only
3. Which of the following is not a component of central processing unit?  
 (1) Arithmetic Logic Unit  
 (2) Program Counter  
 (3) Control Unit  
 (4) L1 cache memory  
 (5) Random Access Memory

4. Which of the following is in the ascending order of speed of memory and secondary devices from left to right?
- (1) Register, floppy disk, harddisk, main memory
  - (2) Main memory, floppy disk, harddisk, register
  - (3) Floppy disk, harddisk, main memory, register
  - (4) Harddisk, floppy disk, main memory, register
  - (5) Floppy disk, main memory, harddisk, register
5. Which of the following is the function of basic input-output system (BIOS)?
- (1) It provides physical interfaces for various devices
  - (2) It provides programs for central processing unit (CPU) in order to communicate peripherals
  - (3) It provides memory space for loading of applications from hardware
  - (4) It provides electric power required for computer
  - (5) It provides memory space needed for computer
6. "Jack Kilby created ..... in 1958 to establish that resistors and capacitors can be located in the same semi-conductor".
- Which of the following is appropriate to fill the blank in?
- (1) Vacuum tube
  - (2) Point-contact transistor
  - (3) Integrated circuit
  - (4) Microprocessor
  - (5) Electronic valve
7. Which of the following factor(s) can be used to compare the characteristic(s) of different memory/memories?
- A - Physical size  
B - Speed  
C - Capacity  
D - Cost
- (1) A only      (2) B only      (3) B,C only      (4) B,C,D only      (5) A,B,C,D all
8. Consider the following statements.
- A - Static random access memory (SRAM) has more density than dynamic random access memory (DRAM)
- B - Dynamic random access memory technology is used as the technology of register
- C - Static random access memory has more speed than dynamic random access memory
- Which of the above is /are incorrect?
- (1) A only      (2) B only      (3) C only      (4) A,B only      (5) A,B,C all
9. Two's complements of  $9_{10}$  and  $(-6)_{10}$  respectively.
- (1)  $0000110_2$ ,  $11110111_2$       (2)  $1000110_2$ ,  $10010111_2$       (3)  $00001001_2$ ,  $11111010_2$
- (4)  $11100110_2$ ,  $11100011_2$       (5)  $00000110_2$ ,  $11110111_2$
10. Which of the following is equivalent to  $13.375_{10}$ ?
- (1)  $1101.110_2$       (2)  $1001.011_2$       (3)  $1101.101_2$
- (4)  $1101.011_2$       (5)  $1111.011_2$

11.  $456_8 + 27_8 =$

A -  $267_8$

B -  $111010110_2$

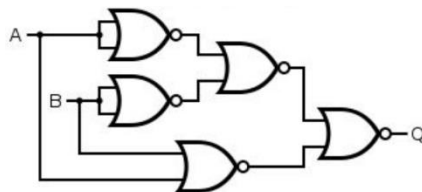
C -  $1D6_{16}$

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

12. Which of the following is the simplified form of Boolean expression  $ABC + A\bar{B}C + \bar{A}BC$ ?

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

13. What is the equivalent logic to the output Q of the following logic circuit?



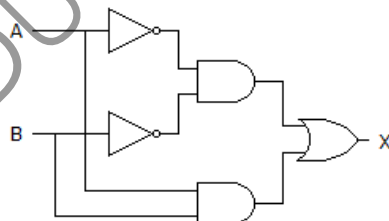
- (1) OR      (2) XOR      (3) NOR      (4) XNOR      (5) AND

14. What is the simplified Boolean expression of the following Karnaugh map?

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

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

15. Which of the following is /are Boolean expression(s) of the output X of the following logic circuit?



A -  $AB + (\bar{A} + \bar{B})$

B -  $AB + \bar{A}.\bar{B}$

C -  $AB + A + B$

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

16. Consider the following statements about adder in digital logic circuits.

A - Half-adder receives two binary digit inputs

B - Half-adder gives two binary digits as outputs

C - A full-adder can be created using two half-adders

Which of the above is /are correct?

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

17. "The operating system ensures that the memory resources allocated to each program requires".  
The main function related to this statement is called.
- (1) Process management                      (2) Network management                      (3) Hardware management  
(4) Memory management                      (5) File management
18. In operating system, "..... is a data structure containing the information required to manage the process scheduling of a specific process".  
Which of the following is appropriate to fill the blank in?
- (1) Context switching                      (2) Process control block (PCB)                      (3) Scheduler  
(4) Swapping                      (5) Paging
19. The operating system uses various ways to make space allocation for the files. Among them, "..... creates a table of pointers at the time the file is created".  
Which of the following is appropriate to fill the blank in?
- (1) Linked allocation                      (2) Harddisk allocation                      (3) Contiguous allocation  
(4) Indexed allocation                      (5) Resource allocation
20. In operating system, "..... is a hardware component that maps the addresses between virtual memory and physical memory".  
Which of the following is appropriate to fill the blank in?
- (1) Memory management unit (MMU)  
(2) Process control block  
(3) Scheduler  
(4) Page table  
(5) Page fault
21. In operating system, "..... helps to increase the accessing speed of file by consolidating fragmented files on a harddisk". Which of the following is appropriate to fill the blank in?
- (1) Fragmentation                      (2) Disk partition                      (3) Defragmentation  
(4) Task manager                      (5) File manager
22. Consider the following statements about file allocation table (FAT).  
A - Table has an entry for each file block  
B - A directory is maintained for indexing the block  
C - The directory of a table is indexed to the first block of the file  
Which of the above is /are correct?
- (1) A only                      (2) B only                      (3) C only                      (4) A,C only                      (5) A,B,C only
23. Consider the following statements about DNS server.  
A - It resolves IP addresses to computers dynamically  
B - It shares an Internet connection among many computers  
C - It converts data packets receiving from private IP addresses into public IP address  
D - It maps domain name to the corresponding IP address  
Which of the above is /are correct?
- (1) A only                      (2) B only                      (3) C only                      (4) D only                      (5) A,B,C only

[See page 5]

**24.** Which of the following is a function of POP (Post Office Protocol)?

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

**25.** In computer network, IP (Internet protocol) functions in ..... layer of the 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

**26.** Which of the following(s) is /are the characteristic(s) of TCP (Transmission Control Protocol) compared to UDP (User Datagram Protocol)?

- A - Connection-oriented
- B - Low overhead
- C - Ordered sequence of data packets
- D - Unreliable

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

**27.** Which of the following is class B IP address?

- (1) 193.168.1.4      (2) 139.67.3.5      (3) 10.6.5.7      (4) 126.7.6.4      (5) 224.5.64.1

**28.** Consider the following statements about fiber optic cable.

- A - more expensive than twisted pair cable
- B - it has more attenuation in comparing with other copper cables
- C - data transmission speed is higher than co-axial cable

Which of the above is /are correct?

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

**29.** Consider the followings.

- A - Data encryption
- B - Digital signature
- C - Anti-virus software
- D - Phishing

Which of the above can be considered as security methods for computer and data?

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

**30.** In computer networks, which of the following is the correct order of data encapsulation from left to right?

- (1) frame, bit, packet, segment, data
- (2) segment, bit, frame, packet, data
- (3) bit, frame, packet, segment, data
- (4) packet, frame, bit, segment, data
- (5) data, packet, bit, frame, segment

**31.** How many subnets and hosts can be provided by the network address 172.16.0.0/19?

- (1) 7 subnets, 30 hosts each
- (2) 7 subnets, 2046 hosts each
- (3) 8 subnets, 30 hosts each
- (4) 7 subnets, 2046 hosts each
- (5) 8 subnets, 8190 hosts each

**32.** Which of the following is also software testing sequence performing during software development from left to right?

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

**33.** Consider the following statements about software process models.

- Software tasks are divided with time slices for every release
- It is an iterative approach
- Stable and dynamic user requirements may be easily adapted

Which of the following is a software process model that has above these characteristics?

- (1) Waterfall model
- (2) Spiral model
- (3) Agile model
- (4) Prototyping model
- (5) Rapid application development

**34.** “..... will carry out preliminary activities such as identifying users' requirements, analyzing and defining problems during software development”.

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

- (1) System analyst
- (2) Software engineer
- (3) Hardware technician
- (4) Network administrator
- (5) Database administrator

**35.** Which of the following is a non-functional requirement of the online e-banking system?

- (1) Customer shall be able to check his / her bank transaction details
- (2) Customer shall be able to know his / her account balance
- (3) Customer shall be able to obtain an attractive software interface
- (4) Customer shall be able to perform transactions
- (5) Customer shall be able to order for new cheque book

**36.** Which of the following is considered as a closed system?

- (1) School
- (2) Human nervous system
- (3) General purpose computer
- (4) Radio
- (5) Human digestive system

37. Consider the following statements about expert systems.

A - It reveals the ability of making decision of human experts

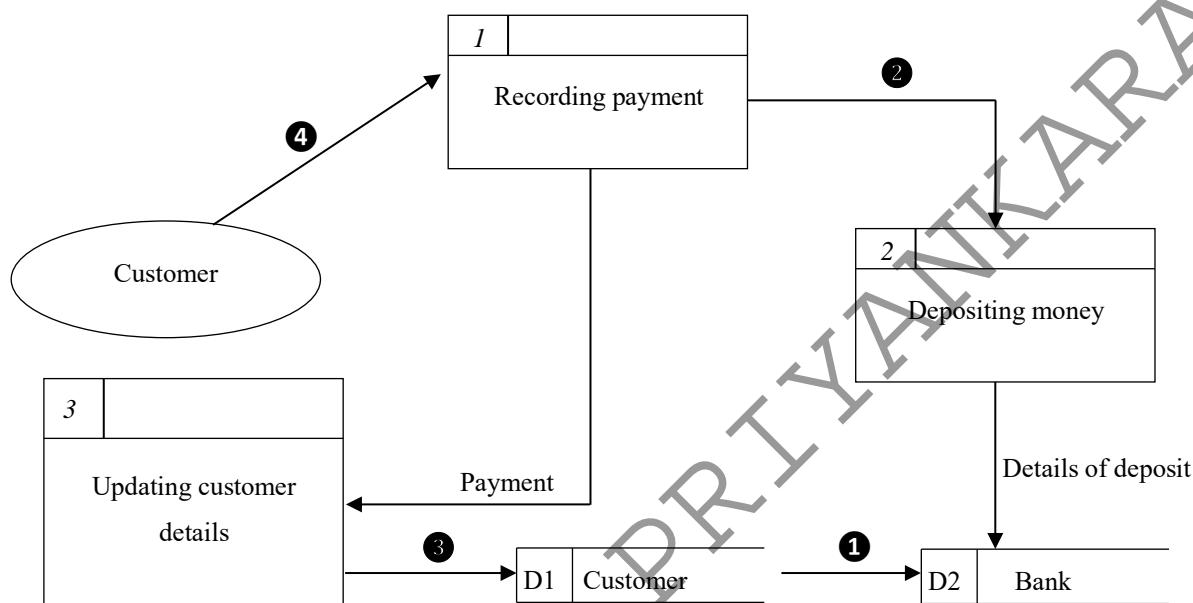
B - It provides the solutions for complex problems using knowledge logically

C - It replaces human experts fully

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

38. Consider the following segment of a dataflow diagram (DFD) related to the transactions performed by a customer with bank.



Which of the following is /are invalid dataflow(s) in this segment of the dataflow diagram?

- (1) ① only                      (2) ② only                      (3) ③ only                      (4) ④ only                      (5) ①, ③ only

39. The so-called function of verifying whether a newly developed software meets the requirements of the users during software development.

(1) System design

(2) System maintenance

(3) System analysis

(4) System testing

(5) Coding

40. Which of the following is /are correct about the following statements about customized packages?

A – They are developed to fulfill the specific requirements of the users

B – Their most of the features are used by the users while comparing with commercial off the shelf packages

C – They are less expensive while comparing with commercial off the shelf packages

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

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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

A

20

E

II

Gr. 12 (2022)

Part – II A

Answer all questions

1.

(a)

(i) Give  $23_{10}$  in the form of 8-bits two's complement.

.....

.....

(ii) Give  $-16_{10}$  in the form of 8-bits two's complement.

.....

.....

(iii) Calculate  $23_{10} - 16_{10}$  in the form of 8-bits two's complement.

.....

.....

(iv) State two advantages of two's complement method.

.....

.....

(b)

(i) Write down any two in major types of cloud computing.

.....

.....

(ii) Suggest briefly any two ways applicable to reduce digital divide among Sri Lankan people.

.....

.....



2.

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(a) State whether each of the following statements regarding data communication and computer networks is **True** or **False**.

(i) UDP (User Datagram control Protocol) creates a virtual circuit between sender and receiver.

(ii) Frequency is remained unchanged while amplitude and phase are changed in frequency modulation.

(iii) IP (Internet Protocol) is a connection-oriented protocol.

(iv) In computer network, flow control functions in application layer of the OSI network reference model.

(v) Proxy server traslates data packets received from private IP addresses into the public IP address.

(vi) The main goal of using network switch is to connect two computer networks together.

(vii) CIDR (Classless Inter-domain routing) allows the efficient allocation of the IP addresses.

(viii) In NRZ (Non-Return to Zero) encoding system, voltage changes from low to high or high to low in the middle of the signal.

No.	True / False	No.	True / False
(i)		(v)	
(ii)		(vi)	
(iii)		(vii)	
(iv)		(viii)	

(b) If an address of a network is 193.5.6.0. Its usable number of hosts is 14.

(i) What is the subnet mask of this network?

.....

(ii) What is the maximum subnets?

.....

.....



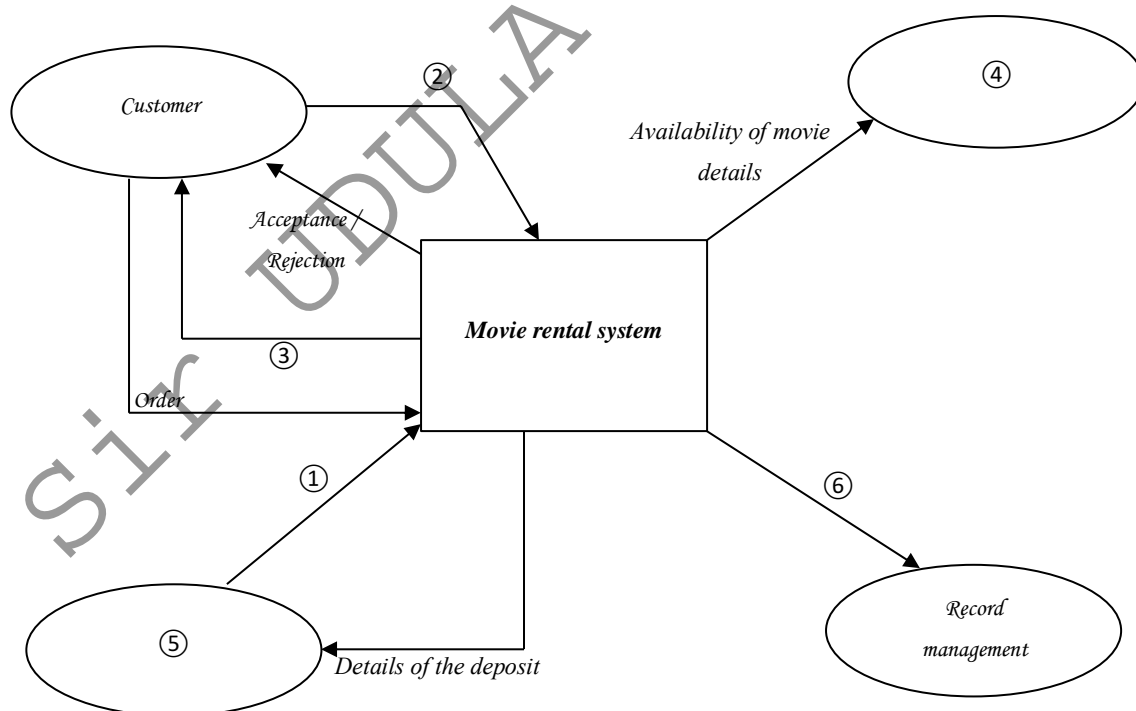
(c) In computer networks, draw the OSI network reference model.

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3.

(a) Consider the following context diagram illustrating the movie rental system of a shop.

A shop offers the service of renting movies to its customers. A customer can submit a request to receive the movie. While the request is accepted, the system will check whether the movie has it in the store or not. Wherever the film is in the shop, the payment for the film will be made by the customer. At the same time, the customer will receive an invoice and the DVD of the film in question. All the details of the movie rental for the rent are recorded in a record management system. The details of the deposit and the details of the payment are sent to the payment details system. Order from the customer will not be accepted by the system unless there is a specific movie in the shop.



Write down the spaces given in the context diagram in the following spaces using appropriate words / phrases.

- ① .....
- ② .....
- ③ .....
- ④ .....
- ⑤ .....
- ⑥ .....

(b) Fill in the blanks of the sentences given below from the following list as appropriate. Write down the numbers in the list at spaces.

**Lists:** [① - Whitebox testing, ② - Spiral model, ③ - Prototyping model, ④ - Waterfall model, ⑤ - Blackbox testing, ⑥ - RAD model, ⑦ - Integration testing]

- (i) ..... is a sequential (linear) process model used in software development.
- (ii) ..... is a combination of iterative development process.
- (iii) ..... is an initial version of a software system that is used to demonstrate concepts, try out design options, and find out more about the user requirements.
- (iv) ..... in which software structures (codes) will be tested. During this process, the programs will be tested. This requires knowledge of how the software works.
- (v) ..... in which the new system being developed will be tested by the end users with the help of developers using actual data.

(c) Consider the following scenario.

A school has a new system to manage student athletics. The old system is manual system. A new system is introduced to manage students, their teams, seasons, and their coaches. At first, the new system simply manages teams. Then the new system manages seasons (and school years), slowly, the new system is increased to manage coaches, players and finally events. At the end of the implementation, the new system is managing everything related to student athletics and the old manual system is removed from the usage.

(i) Which deployment method is mostly appropriate to implement this system?

.....

(ii) Write down one advantage of system deployment method as given in (i) above.

.....

.....



4.

(a) An application running in the computer uses 101000111011010101 bits virtual memory. If the number of pages is 128,

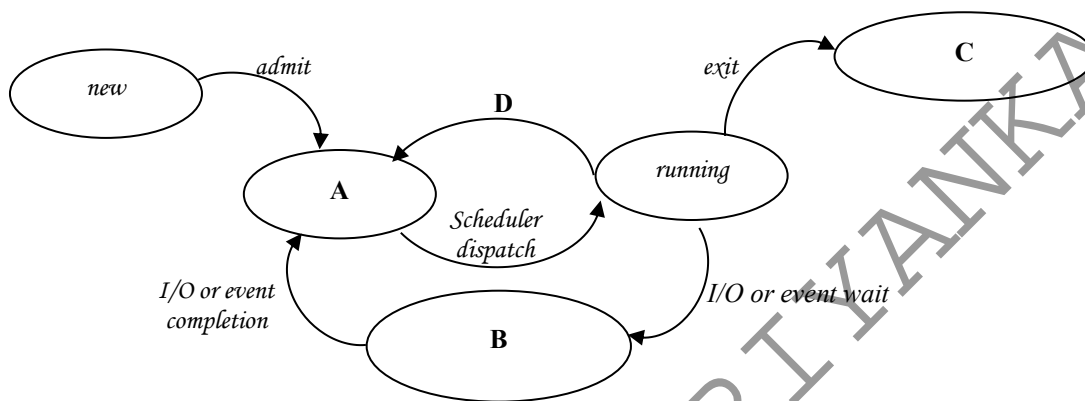
(i) How many bits are required for a page?

.....

(ii) What is offset /displacement?

.....

(b) Consider the following process transition diagram of the multitasking operating system.



Write down appropriate terms / phrases for the labels A,B,C and D in the following table.

A	
B	
C	
D	

(c) Write down two characteristics of contiguous file allocation.

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

(d) Write down one advantage of using virtual memory in modern operating systems.

.....  
 .....

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தகவல் தொடர்புத் தொழினுட்பவியல் II  
Information & Communication Technology II

B

20

E

II

Gr. 12 (2022)

Part – II B

Answer any two questions only.

(5) Consider the following scenario.

A digital logic circuit is set up for an automatic door system. The automatic door has two sensors A and B on both sides of the door. The door opens when at least one of these sensors is activated. The door system, using a manual switch C, starts (switch on-logical value-1) or stops (switch off-logical value-0). The door will not open until the switch on. Output F of the logic circuit will be for opening door (switch on-logical value-1) or not-opening (switch off-logical value-0).

- Construct a truth table for this system.
- Write down Boolean expression in SOP form using the truth table.
- Simplify the Boolean expression you obtained in (i) above using Karnaugh map.
- Draw logic circuit for this simplified Boolean expression using AND, OR, NOT logic gates only.
- Draw the logic circuit again for this Boolean expression obtained in (b) above using NOR gates only.

(6)

- Compare and contrast bus topology and star topology (one comparison is enough).
- Write down one advantage of variable length subnet mask (VLSM) in allocating IP addresses to computers rather than fixed length subnet mask (FLSM).
- Consider the following scenario.

A wood furniture manufacturing company that uses five Local Area Networks (LANs) for its production, marketing, accounting, sales and information technology departments. Each department has the number of computers as shown in the table below.

Departments	Number of computers in each department
Production	15
Marketing	12
Accounting	14
Sales	22
Information Technology	25

An IP block 196.1.1.0 /27 is given to the network administrator. The network administrator is required to allocate IP addresses for all nodes in each department. Five subnets are to be setup for this purpose and further this network is connected to a public IP address for the Internet usage of the employees. IT department is connected directly to the Internet. 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 five switches, network cables, proxy server and DHCP server are given to the network administrator for this purpose.

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

(ii) Allocate IP addresses for all computers, printers and servers using the following table as a help. Use fixed length subnet mask (FLSM) for this purpose.

Departments	Network address	Broadcast address	Subnet mask	Usable IP address range
Production				
Marketing				
Accounting				
Sales				
Information Technology				

(7)

(a) Some of the functional and non-functional requirements of the automated teller machine (ATM) are given below.

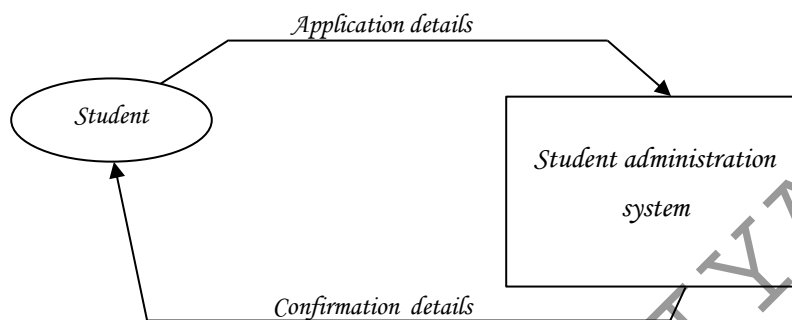
- (A) The ATM shall be able to perform 10000 money transactions in a second.
- (B) A customer shall be able to deposit his / her money
- (C) A customer shall be able to withdraw his / her money
- (D) The user interface of the ATM should be able to be easy-to-use for customer
- (E) A customer shall be able to know his / her money balance
- (F) The ATM shall be able to check the validity of the ATM card of customers
- (G) Three chances shall be able to provide for customers while they enter their four digit secret code
- (H) The ATM shall be able to check the account number of customers

Classify the user requirements of the automated teller machine (ATM) whether the functional or non-functional requirements separately mentioned above (it is sufficient to write only their labels).

- (b) At a university, students can choose to study and register for their degree. Consider the following scenario regarding the corresponding student administration system.

Students first submit their application details to the receptionist counter. The university checks that the course is available. Course details are obtained from course file for this. The student enrollment process takes place on the basis of whether the particular course is accepted or rejected. Enrolment details are then sent to the course file. As well as specific student details are stored in the student file. Eventually the student registration details are sent to the registrar's unit where the student registration is confirmed. Confirmation details are eventually provided to students.

The context diagram for this system is given as follows.



Draw Level -1 Data Flow Diagram (DFD) for the student administration System using SSADM clearly.

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