

Information & Communication Technology (ICT) தகவல் தொடர்புத் தொழினுட்பம் Information & Communication Technology (ICT) தகவல் தொடர்புத் தொழினுட்பம் Information & Communication Technology (ICT) தகவல் தொடர்புத் தொழினுட்பம்

G.C.E. (A/L) Examination

Third Term – February 2024

Conducting By

Fieldwork Center (FWC), Thondamanaru

Information & Communication Technology (ICT)

Grade 12 (A/L) 2024 Part – I Time: 3 hours

Instructions: Part I

- ❖ Answer all questions
- ❖ Write down your index number on the space provided.
- ❖ In each of the questions 1 to 30, 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. One of the principal inventors of the “ENIAC” was

(1) John Von Neumann	(2) Blaise Pascal	(3) Charles Babbage
(4) Ada Augusta Lovelace	(5) John Presper Eckert	
2. What is the technology used in third generation computers?

(1) Vacuum tubes	(2) Transistors	(3) Integrated circuits
(4) VLSI (Very Large-Scale Integrated Circuits)	(5) Micro processor	
3. Consider the following computer memory types.

A – Random Access Memory
B – Cache Memory
C – Flash Memory
D – Registers
E – Read Only Memory

 Which of the above are non-volatile memory types?

(1) A only	(2) E only	(3) C only
(4) C and E only	(5) A, B, C and D only	
4. Which of the following components is located outside the microprocessor?

(1) Arithmetic Logic Unit (ALU)	(2) RAM	(3) Control Unit
(4) Register	(5) Level 1 cache memory	
5. Which of the following is **not** a typical use of the Random Access Memory (RAM) of a personal computer?

(1) Keeping data for processing.	(2) Holding instructions for operations.
(3) Providing storage for operating system.	(4) Retaining information for output.
(5) Keeping the BIOS program for boot-up.	

6. The content stored in is read by using the optical technology.

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

- (1) Flash Memory (2) Floppy Disk (3) Magnetic Tape
(4) Compact Disk (5) Hard Disk

7. The most significant digit (MSD) and the least significant digit (LSD) of the number 023.0750 are respectively.

- (1) 0 and 0 (2) 2 and 0 (3) 2 and 5
(4) 0 and 5 (5) 3 and 0

8. What is the correct 2's complement binary representation of decimal -63_{10} using 8-bits?

- (1) 00111111 (2) 11000001 (3) 11000010
(4) 10100000 (5) 11000010

9. What is the correct result of bit-wise AND operation between the two binary numbers 10101001_2 and 11101101_2 ?

- (1) 11101101 (2) 11101011 (3) 10010110
(4) 10101001 (5) 10011101

10. What is the correct decimal equivalent of hexadecimal $FB.8_{16}$?

- (1) 251.5_{10} (2) 240.125_{10} (3) 243.25_{10}
(4) 11.375_{10} (5) 251.125_{10}

11. What is the binary equivalent to decimal 97.3125_{10} ?

- (1) 1100001.0011 (2) 1000001.0111 (3) 1100001.0101
(4) 1100001.1010 (5) 1100001.0110

12. Which of the following are equivalent to hexadecimal number $3A74_{16}$?

A- $1010\ 0111\ 0100_2$

B- 2676_{10}

C- 2564_8

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

13. Which of the following is the equivalent Boolean expression to $AB + A\bar{C} + B\bar{C}$.

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

14. Which of the following is equivalent to $f_{(A,B,C)} = \overline{A + B.C} + \overline{AB}$ after simplifying following Boolean statement by using De Morgan's theorem.

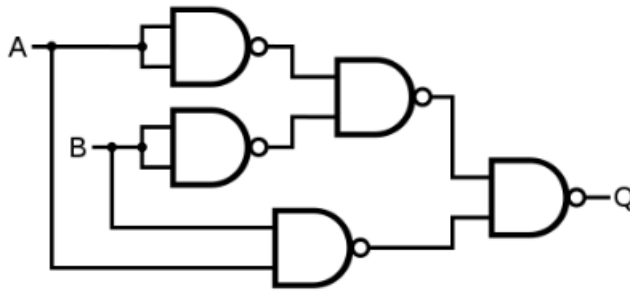
- (1) $\bar{A} + BC$ (2) $\bar{A}\bar{B} + C$ (3) $\bar{A} + B$ (4) $\bar{A}\bar{B}$ (5) $\bar{B} + C$

15. The logic expression relevant to the output of the given truth table is.

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0

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

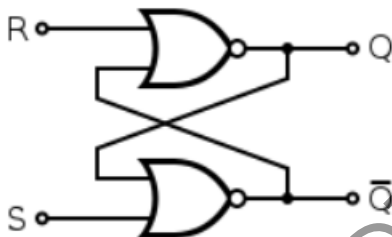
16. Consider the following logic circuit diagram.



Which of the following Boolean logic is equivalent to the output Q of the logic circuit given above?

- (1) OR (2) AND (3) XNOR (4) NOT (5) XOR

17. A SR flip-flop is constructed using two NAND gates.



	S	R	Q	\bar{Q}
Initially	1	0	1	0
S change to 0	0	0	a	b
R change to 1	0	1	c	d
R change to 0	0	0	0	1

What should be the values of a, b, c, d respectively in the truth table for the above SR flip-flop?

- (1) a=0, b=1, c=1, d=0 (2) a=1, b=0, c=0, d=1 (3) a=1, b=1, c=1, d=1
(4) a=0, b=1, c=0, d=1 (5) a=1, b=0, c=0, d=0

18. Consider the following statements about the main function of an operating system.

- A – Memory Management
- B – Process Scheduling
- C – File Handling
- D – Virus Detection
- E – User Interface

Which of the above statement/s is/are true.

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

19. Which of the following is usually used to boot-up personal computers?

- (1) Firmware (2) Malware (3) Adware
(4) Ransomware (5) Liveware

20. Through which of the following, will a device controller that controls a device deal with the operating system?

- (1) Application Software (2) Assembler (3) Compiler
(4) Device Driver (5) Utility Software

21. Consider the following statements.

A – DHCP server in an IP network dynamically allocate IP address to network devices.

B – DNS server translates domain names to IP address.

C – Proxy server caches the recently accessed web pages.

Which of the above statement/s is/are correct.

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

22. TCP/IP computer networks. Transport Protocol Data Unit (TPDU) is referred as a:

- (1) Packet (2) Frame (3) Segment
(4) Window (5) Message

23. is used for analog signal to digital signal conversion.

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

- (1) Amplitude Modulation – AM (2) Frequency Modulation – FM
(3) Time Division Modulation – TDM (4) Phase Modulation – PM
(5) Pulse Code Modulation – PCM

24. Which of the following is a possible IP address in a network with IP address 172.16.50.100 and Subnet mask 255.255.240.0?

- (1) 172.16.50.0 (2) 172.16.48.0 (3) 172.16.0.0
(4) 172.16.32.0 (5) 172.16.16.0

25. A computer in a network is configured with the IP address 192.168.50.145 and the subnet mask 255.255.255.224. Which of the following IP address **cannot** be assigned to a computer in the same network?

- ((1) 192.168.50.130 (2) 192.168.50.135 (3) 192.168.50.159
(4) 192.168.50.150 (5) 192.168.50.158

26. Which of the following is considered as an erroneously received byte in an odd parity system?

- (1) 01010111 (2) 10010010 (3) 10110011
(4) 11001001 (5) 11010110

27. Which of the following shows the correct order of software testing?

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

28. Which of the following feasibility types is generally **not** carried out during the development of a system to be used only in-house?

- (1) Economic feasibility
- (2) Market feasibility
- (3) Operational feasibility
- (4) Organizational feasibility
- (5) Technical feasibility

29. Consider the following system implementation methods:

A – Direct

B – Phase

C – Parallel

Which of the above methods can be recommended to implement an emergency call handling system?

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

30. Consider the following statements regarding the requirements of Bank ATM:

A – A customer shall be able to inquire his/her bank balance.

B – A customer should be able to deposit money through ATM.

C – Maximum withdrawal amount per day is Rs. 100,000.

Which of the above requirements is/are functional requirement(s) of the ATM.

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

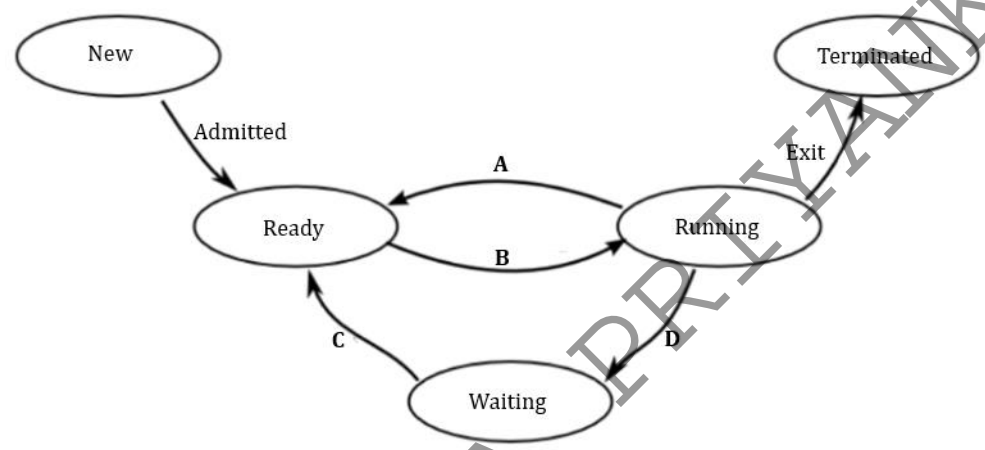
Structured questions

Answer all the questions on this paper itself

Do not write in this column

1.

(a) The state transition that could occur in a process running on a computer with a multi-tasking operating system is shown in the following diagram:



Choose and write down the transition triggers indicated by labels A, B, C and D from the list given.

List = {interrupt, Input/Output (I/O) or event completion. I/O or event wait, scheduler dispatch}

- A :
- B :
- C :
- D :

(b) Sate three Service model in Cloud Computing.

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(c)

(i) Complete the Half Adder Truth Table below.

A	B	f-Sum	f-Carry
0	0		
0	1		
1	0		
1	1		

(ii) Write the Boolean expression for f-Sum and f-Carry for the above truth table.

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(iii) Draw a logic circuit for the above expression in (ii) by only using NOR gates.

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2.

(i) Write down the two's complement representation of 17_{10} using 8 bits.

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(ii) Write down the two's complement representation of -25_{10} using 8 bits.

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(iii) Compute $17_{10} + (-25_{10})$ using the above representations (i) and (ii).

(iv) Express the two's complement result obtained in (iii) above in ordinary decimal form.

(v) Give the correct results of bit-wise AND operation and bit-wise OR operation between two binary numbers 11010101_2 and 00101010_2 ?

3.

a. The diagram below shows the OSI reference model and its mapping to the TCP/IP model. Write the correct names of the layers indicated by the labels A, B, C, D, E, and F.

OSI Reference Model		TCP/IP Model
1	Application Layer	E
2	A	
3	Session Layer	
4	B	Transport Layer
5	C	Internet Layer
6	Data Link Layer	F
7	D	

A :- B :-

C :- D :-

E :- F :-

b. Parity Check is a simple technique to detect errors in data communication.

Assume the seven bits 1011101 need to be transmitted. Explain how the odd parity check can be performed to detect any error in its transmission.

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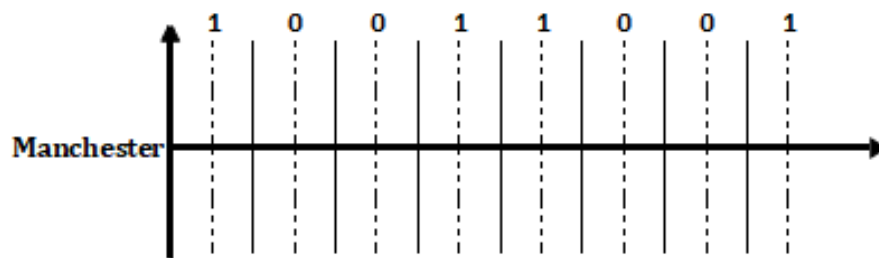
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c. Match each of the given **Devices** labelled from **P** to **T** to the corresponding **Description** labelled from **1** to **5**.

Device	Description
P – Client	1 -stores network programs and data files for the users to access.
Q – Hub	2 -a connecting device between Local Area Networks (LAN) and Wide Area Networks (WAN).
R – Router	3 -when a message is received, this transmits it only on the port to which the destination computer is attached.
S – Server	4 -request services and content from other computer.
T – Switch	5 -when a message is received, this broadcasts it on all ports to all attached hosts.

P :- Q :- R :- S :- T :-

d. Draw the graphs of Manchester scheme using “10011001”.



4. (a) Following is the **context diagram** for the operation of a **VIDEO Rental System** station, with missing **data flow** at P, Q, R and S is given in Figure 1 below.

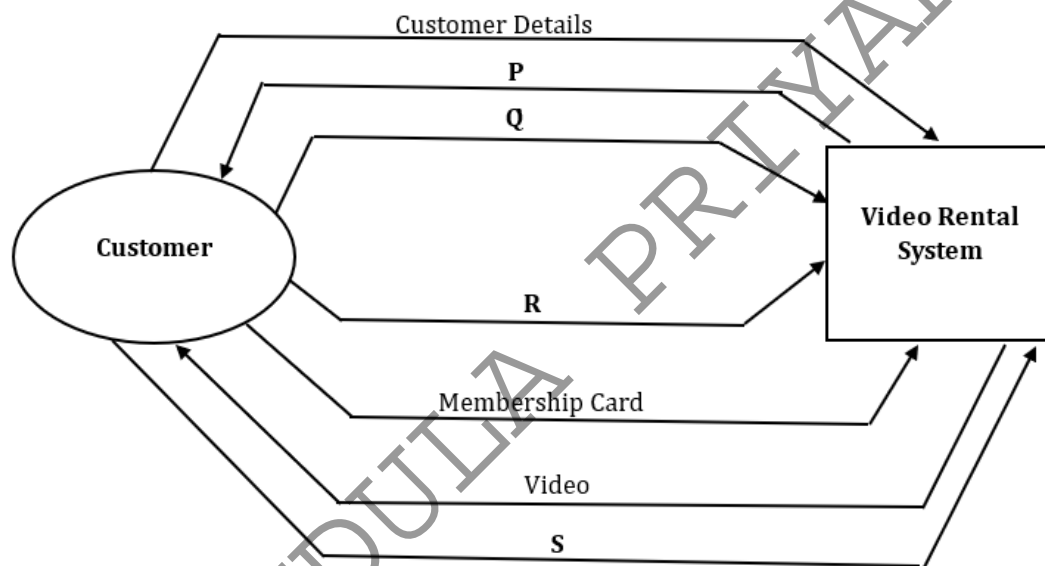


Figure 1

Write down the most suitable item for P, Q, R and S by selecting from the given list.

List: { Video, Membership Card, Request for Video, Payment}

P :-

Q :-

R :-

S :-

(b) Level 1 of the DFD for the above context diagram is shown in Figure 2.

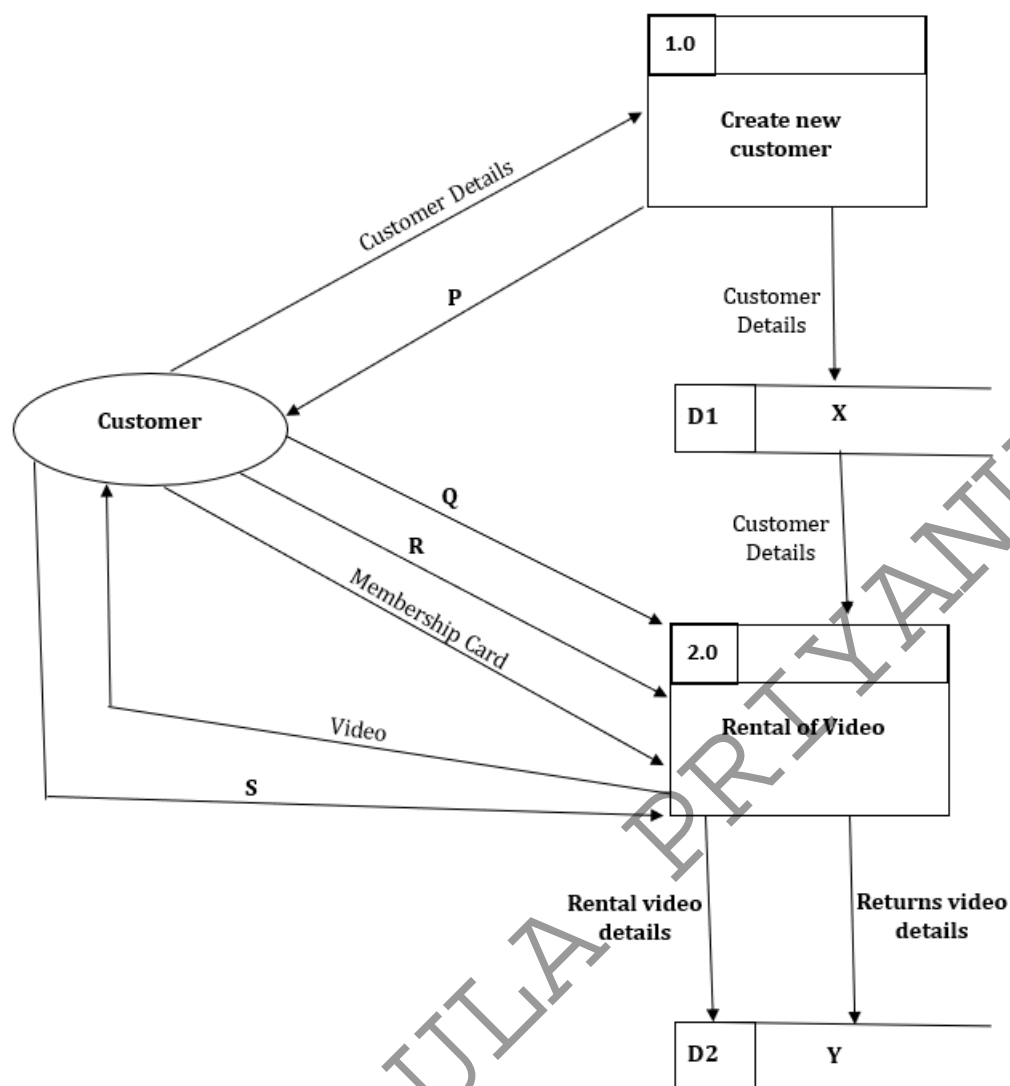


Figure 2

Write down the most suitable item for X and Y by selecting from the given list.

List: {Inventory file, Customer file, Sales file}

X :-

Y :-

(c)

(i) Write down **two** differences between **white box testing** and **black box testing**?

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(ii) Write down **two** differences between **parallel deployment** and **pilot deployment**?

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Sir UDULA PRIYANKARA



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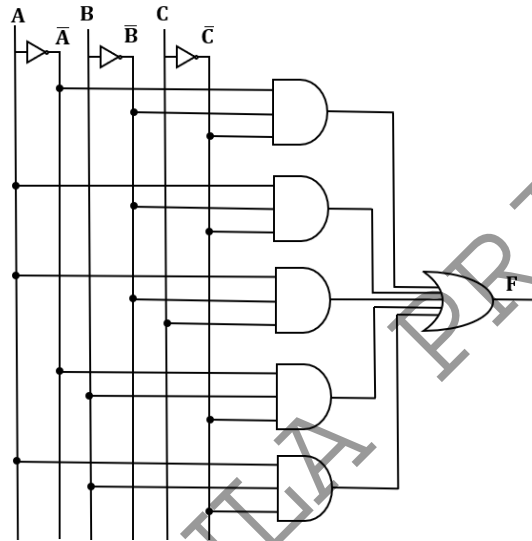
Information & Communication Technology (ICT)

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Part – II B

Answer any **two** questions only.

1. Consider the logic circuit shown in the following figure in which **A**, **B** and **C** are the inputs and **F** is the output.



- (i) Draw the complete truth table for the above circuit.
- (ii) Complete the Karnaugh map relevant to the above circuit according to the following format

A \ BC	00	01	11	10
0				
1				

- (iii) Using the Karnaugh map, derive the most simplified sum-of-products expression for the output **F**. Show the loops clearly on the Karnaugh map.
- (iv) Draw a logic circuit for the above **simplified** expression in (iii) by only using **AND**, **OR** and **NOT** gates.
- (v) Draw a logic circuit for the above **simplified** expression in (iii) by only using **NAND** gates.

2. Consider the following scenario:

Suppose that the **ABC** Company has received the **192.168.50.0/25** IP address block to be distributed among its four departments.

It is required to subnet the above IP address block to satisfy the following requirements. Assume that each department is located in a separate building.

Subnet Number	Department Name	Number of Computers
D01	Accounts	60
D02	Sales	15
D03	Administration	07
D04	IT Services	06

- (i) How many addresses are available in the given address block.
- (ii) Write the first address and the last address in the given address block.
- (iii) Write the subnet mask of the given address block in dotted decimal notation.
- (iv) Once subnetting is done, fill the following table.

Subnet Number	Network Address	Subnet Mask	Usable IP Address Range	Broadcast Address
D01				
D02				
D03				
D04				

- (v) The ABC Company links the three departments' Accounts, Sales and Administration to the IT Services department and connects those departments to the Internet through the IT Services department. The network has been completed by laying the cables and installing four switches, a router and a firewall. The administrator allows all subnets to access the Internet through a proxy server. The proxy server and the DNS server are located in the IT Services department. Draw the labelled network diagram to show the logical arrangement of the computer network of the ABC Company by identifying suitable devices and required cables for all the locations.

- (vi) Write **two** differences between User Datagram Protocol (UDP) and Transmission Control Protocol (TCP) transport layer protocols.

3. Assume that we have a computer that can use 16 – bit virtual address from 0 up to 64K. Assume further that this computer has only 32 KB of physical memory and that the page size in this computer is 4 KB.

- The above 16 – bit virtual address is made up of the *bits of the page number* followed by *offset bits*. How many bits in the address are required to store a page number in this computer?
- User runs a particular program having a size of 32 KB on this computer. A few selected fields of the *page table* of that process at a particular time are shown in the figure below.

Page Number	Frame Number	Present/ Absent
0	101	1
1	000	0
2	000	0
3	110	1
4	011	1
5	000	0
6	111	1
7	000	0

Notes:

- The frame number is indicated in *binary*.
- The virtual address on page 0 are from 0 to 4095 and on page 1 are from 4096 to 8191 and so on.
- The **Present/Absent** bit indicates the validity of the entry. If this bit is 1, the entry is valid and can be used. If it is 0, then the relevant virtual page is not in the physical memory.
 - Assume this program requires accessing virtual address 12500. To which physical address will it get transformed to?
 - Give **two** reasons as to why a particular page of a process could be absent in physical memory.
 - Write down **two** advantages that the use of page tables bring with respect to program sizes compared to the size of physical memory.
 - Which unit is responsible for mapping?
- c. The block size of a disk is 4KB. A portion of its File Allocation Table (FAT) at a particular time is shown below. The portion shown indicates the blocks of the *promax.py* file as well.

FAT

500	502
501	500
502	-1
503	501
504	

Notes:

- The last block of a file is indicated by -1
- The *directory entry* of a file contains the block number of the first block of the file.
 - i. What is the *directory entry* for the *promax.py* file?
 - ii. What is the disk space allocated for the *promax.py* file?
 - iii. Assume that additional improvement are made to the *promax.py* file that results in its size becoming 20 KB. What changes are needed in the FAT for this purpose?
