



தேசிய வெளிக்கள நிலையம் தொண்டைமானாறு

இரண்டாம் தவணைப் பரீட்சை - 2023

National Field Work Centre, Thondaimanaru.

2th Term Examination - 2023

தகவல் தொடர்பாடல் தொழினுட்பவியல்
ICT

Three Hours

Gr -12 (2024)

20

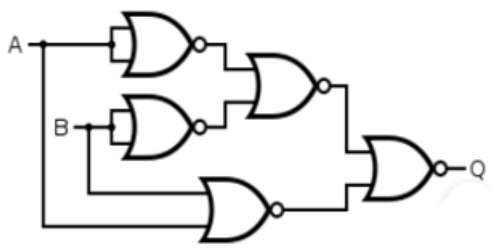
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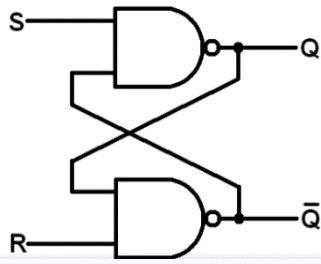
Instructions: Part I

- ❖ 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.

- 01) Who developed the first "Automatic Sequence Controlled Calculator"?
- (1) Gottfried Wilhelm Von (2) Blaise Pascal (3) Charles Babbage
(4) Ada Augusta Lovelace (5) Howard Aiken
- 02) Which of the following correctly lists the given computer storage components in the **ascending** order of **access speed**?
- (1) register, magnetic disk, main memory, cache memory
(2) register, cache memory, main memory, magnetic disk
(3) cache memory, register, main memory, magnetic disk
(4) magnetic disk, main memory, cache memory, register
(5) cache memory, magnetic disk, main memory, register
- 03) Consider the following computer memory types.
- A – CMOS memory
B – cache memory
C - flash Memory
D – hard disk
E – RAM
F- register
- Which of the above are volatile memory types?
- (1) A, C and D only (2) A, D and E only (3) A, E and F only
(4) B, E and F only (5) C, E and F only
- 04) 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

- 05) 5. The component that decodes the instructions fetched into the CPU is called the.
(1) Primary Memory (2) Register Unit (3) Control Unit
(4) ALU (5) Program Counter
- 06) What is the correct 2's complement binary representation of decimal 47_{10} using 8-bits?
(1) 00100111 (2) 00111111 (3) 10111111 (4) 10101111 (5) 00101111
- 07) What is the correct result of bit-wise OR operation between the two binary numbers 10001000_2 and 01010001_2 ?
(1) 11110111 (2) 11011001 (3) 11001111 (4) 10110110 (5) 10101010
- 08) What is the correct decimal equivalent of octal 143.2_8 ?
(1) 96.25_{10} (2) 96.125_{10} (3) 99.25_{10} (4) 99.125_{10} (5) 69.25_{10}
- 09) What is the binary equivalent to decimal 71.325_{10} ?
(1) 00110000.101 (2) 01010000.101 (3) 01000111.011
(4) 01100111.011 (5) 01000111.111
- 10) $543_8 + 1011101_2 =$
(1) 448_{10} (2) 447_8 (3) 678_{10} (4) 500_8 (5) $3C0_{16}$
- 11) Which of the following is the equivalent Boolean expression to $A \oplus B \oplus C$.
(1) $\bar{A}BC + A\bar{B}C + ABC$
(2) $A\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C$
(3) $\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$
(4) $A\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C + ABC$
(5) $A\bar{B} + \bar{A}B + A\bar{C} + \bar{A}B + B\bar{C} + \bar{B}C$
- 12) Which of the following is equivalent to $f_{(A,B,C)} = \overline{A\bar{B} \cdot (A + C)} + \overline{AB \cdot A + \bar{B} + \bar{C}}$ after simplifying following Boolean statement by using De Morgan's theorem.
(1) $\bar{A} + C$ (2) $A + C$ (3) $\bar{A} + B$ (4) $A + \bar{C}$ (5) $\bar{B} + C$
- 13) The logic expression relevant to the output of the given truth table is.
(1) $A + B$
(2) $A \cdot B$
(3) $\bar{A} + \bar{B}$
(4) $A \oplus B$
(5) $A \oplus \bar{B}$
- | A | B | Output |
|---|---|--------|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |
- 14) 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) NOR
(4) NOT (5) XOR
- 

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



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

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=1, c=1, d=1 (3) a=0, b=1, c=1, d=1
 (4) a=0, b=1, c=0, d=1 (5) a=0, b=0, c=0, d=0
- 16) Consider the following statements.
 A – Operating systems are Utility software.
 B – An operating system is needed to control hardware and to manage software.
 C – Apple Macintosh is Free & Open-source operating system.
 Which of the above statement/s is/are true.
 (1) A only (2) B only (3) C only
 (4) A and B only (5) B and C only
- 17) In an operating system, suspending the currently executing process and then resuming or starting another process is termed as:
 (1) Paging (2) Context switching (3) Swapping
 (4) Interrupting (5) Blocking
- 18) In modern operating system, thescheduler determines the transition of processes from the new state to the ready state.
 (1) Mid-Term (2) Long-Term (3) Very Long-Term
 (4) Very Short-Term (5) Short-Term
- 19) Which of the following is **not** a task of a computer operating system?
 (1) Selecting a memory *frame* for a *page* of a process
 (2) Maintaining a list of free memory *frames*
 (3) Maintaining a *page table* for each process
 (4) Monitoring the usage of binary files on a hard disk
 (5) Swapping process between main memory and hard disk
- 20) Consider the following terms related to computer system.
 A – Malware B – Hardware C – Software D – Liveware
 Which of the above are basic components of a computer system?
 (1) A and B only (2) A and C only (3) A and D only
 (4) B and C only (5) B, C and D only
- 21) What is the maximum number of host computers that can be connected to a network of IP address – 192.168.10.5 and a Subnet mask of 255.255.255.128?
 (1) 64 (2) 62 (3) 126 (4) 128 (5) 254

- 22) Which of the following is a possible IP address in a network with IP address 192.168.50.87 and Subnet mask 255.255.255.240?
- (1) 192.168.50.0 (2) 192.168.50.16 (3) 192.168.50.48
(4) 192.168.50.80 (5) 192.168.50.96
- 23) What is the main function of a **Proxy Server** in Internet communication?
- (1) Allocate and release IP address
(2) Translate domain names to IP address
(3) Protect a network from viruses
(4) Provide printing services to users
(5) Share an Internet connection among several computers
- 24) "DHCP" stands for
- (1) Dynamic Hypertext Configuration Protocol
(2) Dynamic Host Connect Protocol
(3) Digital Host Connect Protocol
(4) Dynamic Host Configuration Protocol
(5) Digital Host Configuration Protocol
- 25) Which of the following operating system is suitable for a Aircraft Defense System.
- (1) Single User – Single Tasking (2) Single User-Multi Tasking
(3) Multi User-Multi Tasking (4) Multi-Threading
(5) Real Time
- 26) Which of the following is an open-source software?
- (1) MS Word (2) Windows (3) Mozilla Firefox
(4) Photoshop (5) Auto CAD
- 27) Which of the following convert digital signal to analog data to transmit over an analog telephone network?
- (1) Network Interface Card (NIC) (2) MODEM
(3) Multiplexer (4) Bluetooth adaptor
(5) Wi-Fi card
- 28) A computer in a network is configured with the IP address 192.168.30.150 and the subnet mask 255.255.255.192. Which of the following IP address **cannot** be assigned to a computer in the same network?
- (1) 192.168.30.135 (2) 192.168.30.153 (3) 192.168.30.205
(4) 192.168.30.180 (5) 192.168.30.144
- 29) Two computers with the IP addresses 192.168.70.173 and 192.168.70.185 are connected to a Local Area Network (LAN). Which of the followings is a suitable subnet mask for this network?
- (1) 255.255.128.0 (2) 255.255.255.248 (3) 255.255.255.240
(4) 255.255.255.224 (5) 255.255.224.0
- 30) Which of the following is a valid Subnet Mask?
- (1) 255.255.255.248 (2) 255.0.255.128 (3) 255.255.255.230
(4) 255.255.255.110 (5) 255.255.256.0



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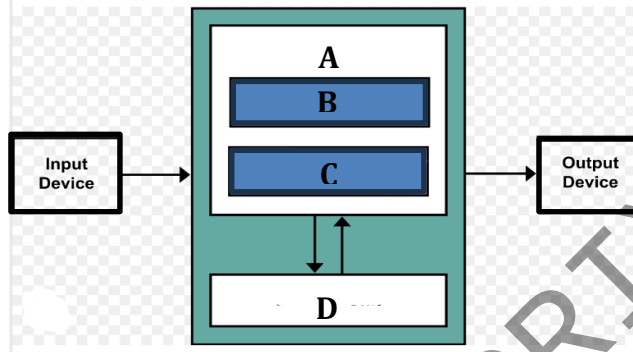
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IIA

Part - II (A)

1.

(a) Consider the diagram below illustrating the Von Neumann structure and write the names of the appropriate elements.



A :

B :

C :

D :

(b) Complete the Full Adder Truth Table below..

A	B	C(C-IN)	f-Sum	f-Carry(C-OUT)
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

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

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(ii) Show the Full Adder equations obtained in question **(i)** above using the rules of Boolean algebra as follows.

$$f\text{-Sum} = A \oplus B \oplus C$$

$$f\text{-Carry} = C.(A \oplus B) + AB$$

(iii) Draw the logic circuit for the short circuit obtained in question (ii) above in a single logic circuit using only AND, OR, XOR logic Gates.

2.

(i) Write down the two's complement representation of 23_{10} using 8 bits.

(ii) Write down the two's complement representation of -9_{10} using 8 bits.

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(iii) Compute $23_{10} + (-9_{10})$ using the above representations **(i)** and **(ii)**.

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

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(v) Convert this 32-bit floating – point number in IEEE 754 single precision number to its equivalent decimal value.

1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

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3.**a.** Write the OSI Seven Layers Model in order.**OSI MODEL**

1	
2	
3	
4	
5	
6	
7	

Do not write
in this column**b.** Parity Check is a simple technique to detect errors in data communication.

Assume the seven bits 1101011 need to be transmitted. Explain how the even parity check can be performed to detect any error in its transmission.

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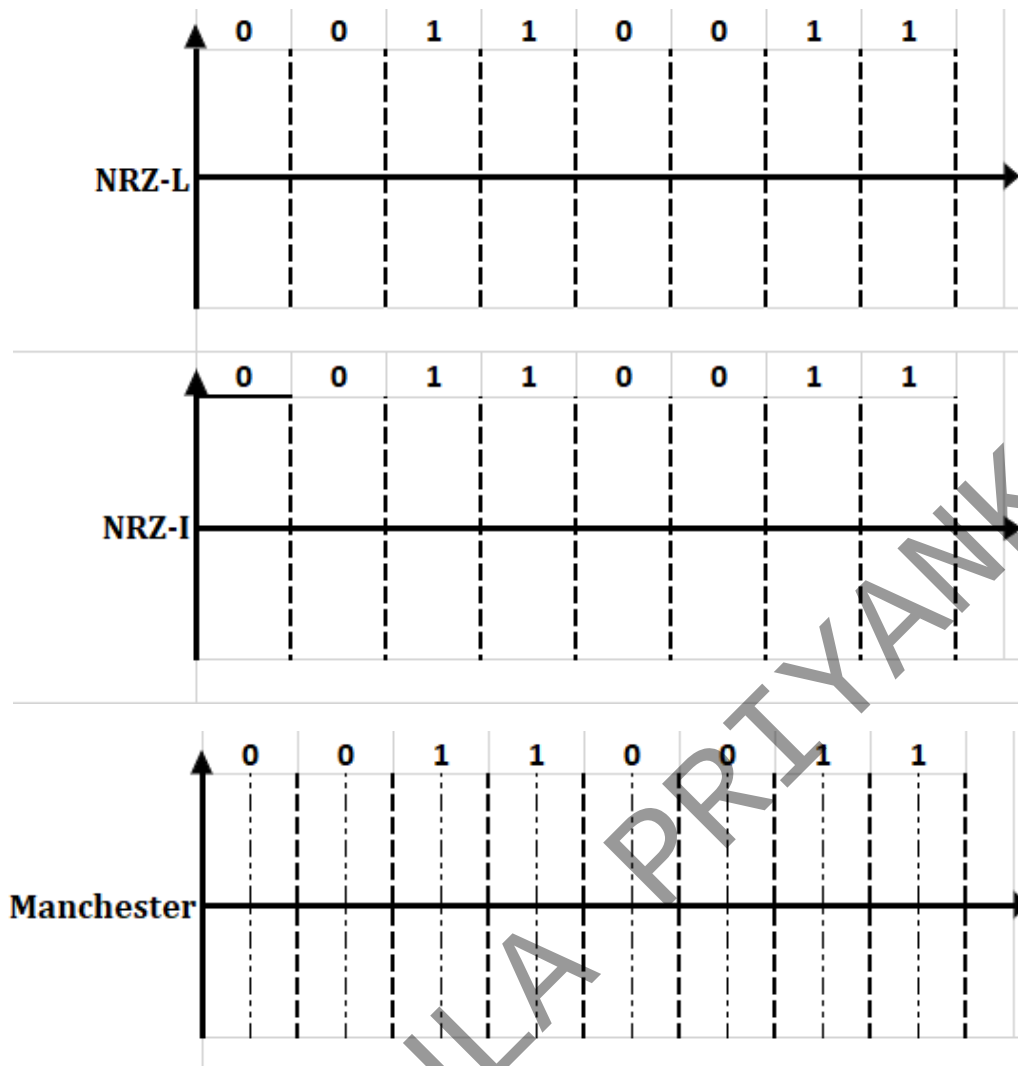
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c. Match each of the given data communication protocols labelled from **A** to **E** to the corresponding description labelled from **1** to **5**.

Protocol	Description
A – Hyper Text Transfer Protocol (HTTP)	1 -provides directory lookup service for given web addresses and URLs.
B – Transmission Control Protocol (TCP)	2 -provides a very reliable data transfer service.
C – Domain Name System (DNS)	3 -used in the world wide web.
D – Internet Protocol (IP)	4 -provides a connection-less transport service.
E – User Datagram Protocol (UDP)	5 -,handles unique addressing of hosts in the Internet.

A :-**B** :-**C** :-**D** :-**E** :-

d. Draw the graphs of NRZ-L, NRZ-I, and Manchester schemes using "00110011".



4. (a) In a certain computer Physical Memory has a total capacity of 64MB, Virtual Address Space is 4GB and Page Size is 4KB.

(i) What is the number of pages in virtual memory?

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

(ii) What is the number of frames in physical memory?

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.....
.....

(iii) What is the number of bits in page offset?

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(b) 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 *myfirst.py* file as well.

FAT

300	302
301	300
302	-1
303	301
304	305

Notes: I. The last block of a file is indicated by -1

II. 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 *myfirst.py* file?

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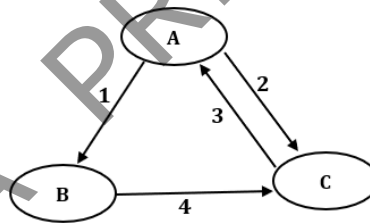
(ii) What is the disk space allocated for the *myfirst.py* file?

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(c) Consider the process transition diagram in the figure:

If the transitions shown are as follows:



- 1- Process blocks for input/output
- 2- Scheduler picks another process
- 3- Scheduler picks this process
- 4- Input/output is completed

Then what are the states indicated by the labels A, B, and C from the list below.

List :- (Blocked, New, Ready, Running)

A:-

B:-

C:-

(d) Give two reasons as to why a page of a process may not be in physical memory.

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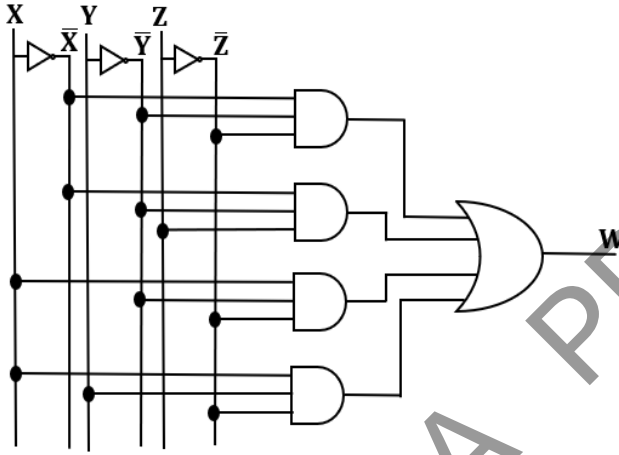
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B

Part - II (B)

Answer all questions.

1. Consider the logic circuit shown in the following figure in which X , Y and Z are the inputs and W 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

X \ YZ	00	01	11	10
0				
1				

- (iii) Using the Karnaugh map, derive the most simplified sum-of-products expression for the output W . Show the loops clearly on the Karnaugh map.
- (iv) Draw a logic circuit for the above simplified expression in (iii) by only using **NOT**, **OR** and **AND** gates.
- (v) Draw a logic circuit for the above simplified expression in (iii) by only using **NOR** gates.

2. Consider the following scenario:

Suppose that the **PQR** Company has received the **192.168.30.128/25** 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	Printer Type
S001	Finance	50	01-Network Printer
S002	HR	15	01-Printer
S003	IT Unit	06	01-Network Printer
S004	Marketing	05	01-Network Printer

The company proposes the following:

- A Local Area Network (LAN) for each Department and the IT unit in order to share specific software and resources
- LANs in each department to be interconnected via IT unit
- All computers to be given efficient Internet connectivity with the help of a DNS (Domain Name System) and Proxy Servers
- An Internet Service Provider (ISP) to supply the Internet connectivity to the IT unit
- The entire network to be protected through a Firewall

(i) Which network topology is the most suitable to satisfy all above mentioned requirements? Give **one** reason to justify your answer.

(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
S001				
S002				
S003				
S004				

(v) Showing clearly the connection topology and the devices, draw the logical arrangement for the company network that the network administrator can implement to fulfill the company's requirements.

(vi) Network administrator decides to dynamically manage the IP address of the entire network. Write down the mechanism that needs to be implemented to achieve this task.
