

RAMAKRISHNA MISSION
VIVEKANANDA CENTENARY COLLEGE, RAHARA, KOLKATA
END SEMESTER EXAMINATION 2022
SEMESTER III
B.Sc. COMPUTER SCIENCE HONOURS

Core Course VII

Full Marks: 50

Time: 2 hours

Answer any five questions:

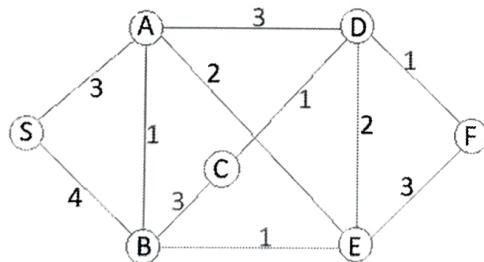
$5 \times 10 = 50$

1. i) What is Polar RZ scheme?
 ii) Comment on data element versus signal element (Consider $r=1, \frac{1}{2}, 2$ and $\frac{4}{3}$).
 iii) Draw the structure of Coaxial Cable and explain functionality of each layer.
 $2 + 4 + 4$

2. i) What is Frequency Division Multiplexing?
 ii) Ten channels, each with a 200-kHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference?
 iii) What do you mean by –
 a) Multilevel Multiplexing
 b) Multiple slot allocation
 c) Pulse stuffing
 $2 + 2 + 6$

3. i) Compare byte-stuffing and bit-stuffing.
 ii) Data 1001101 is sent through a network which has Hamming Code, C(11,7). Determine (only diagram) the codeword being transmitted. Now, 10th bit in the codeword is inverted during transmission. Prove (only diagram) that with C(11,7), the receiver will detect the single bit error and its position.
 iii) Compare HDLC with PPP.
 $2 + (3 + 3) + 2$

4. i) Compare IPv4 and IPv6.
 ii) What is the purpose of subnetting? Prove that 19.16.1.1 /13 and 19.15.1.1 /13, these hosts are on different networks.
 iii) Calculate the shortest path from S to all other nodes using Dijkstra algorithm for following network.



Show that Dijkstra algorithm doesn't work if the weight of (C, D) is changed to -2.

$2 + (1 + 2) + (3 + 2)$

5. i) What is QoS in transport layer? Describe Leaky Bucket process (with diagram).
 ii) State differences between TCP and UDP. Demonstrate Three-way Handshaking process in TCP with block diagram only.
- (2 + 3) + (3 + 2)
6. i) State Nyquist Theorem.
 ii) What is bandwidth? Determine the maximum (theoretical) limit of bit rate (in bits per second), in a noiseless channel, of a Bandwidth of 5000 Hz transmitting 64 levels.
 iii) What is attenuation? A signal travels from point A to point B. The signal power at point A and B are respectively 200W and 170W. What is the attenuation in decibels?
 iv) How many bytes of data can be sent in 15 seconds over a serial link with baud rate of 96000 in asynchronous mode with odd parity and two stop bits in the frame?
- $2 + 3 + 3 + 2$
7. i) Define piggybacking. Why is it useful?
 ii) State and explain the Basic Service Set (BSS) for Wireless LAN as provided in IEEE 802.11 specification.
 iii) Compare and contrast in between the following error recovery protocols.
 a) Stop and Wait ARQ (Automatic Repeat Request)
 b) Go Back n ARQ
- $3 + 3 + 4$
8. i) Define *Crossbar switch*.
 ii) Write and discuss three phases of Circuit switching.
 iii) What is the importance of Virtual Circuit Identifier? Explain with example.
- $2 + 4 + 4$

RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE, RAHARA, KOLKATA
MID SEMESTER EXAMINATION 2021
THIRD SEMESTER
B.Sc. COMPUTER SCIENCE HONOURS
CORE COURSE VII

Time: 1 hour

Full Marks: 25

(Use two separate answer scripts for Group-A and Group-B)

5×5=25Answer any five (5) questions taking at least two from each group:**Group-A**

1. Compare between Polar NRZ-I and NRZ-L schemes. (5)
2. (i) Write advantages of Isochronous Transmission.
 (ii) Why filters are used in FDM Demultiplexing? (2+3) (5)
3. Explain three phases of Circuit Switching.
4. Show how datagram approach is used to deliver 3 packets from Station A to Station B. (5)

Group-B

5. (i) Distinguish between Computer Networks and Distributed System.
 (ii) Differentiate between connection oriented and connectionless services with suitable examples. (2+3)
6. Write down the major functionalities of the Data link layer and the Network layer of OSI Reference Model. (5)
7. (i) What do you mean by Cyclic Redundancy Check (CRC)?
 (ii) With an example, explain how binary Division is used in CRC encoder. (1+4) (5)
8. Explain stop and wait ARQ in the Data link layer.

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MID SEMESTER EXAMINATION 2022
SEMESTER III
B.Sc. COMPUTER SCIENCE HONOURS
Core Course VI

Full Marks: 25

Time: 1 hour

Answer any five:-

1. Write the definition of an operating system with example. Write the key roles of operating system in brief. $2 + 3 = 5$
2. What is the batch processing? Differentiate between batch and timesharing systems. What is time slice in timesharing os? $2 + 2 + 1 = 5$
3. Differentiate multiprocess and multitasking operating system with examples. Write the disadvantages of batch processing. Why turn off of Unix more faster than DOS? $2 + 2 + 1 = 5$
4. What is the kernel in os? Write the list of kernel modules in the OS. Differentiate user and kernel program. $1 + 3 + 1 = 5$
5. What is a process? Describe different process states with diagram. $1 + 4 = 5$
6. Consider the following :- 5

<u>process</u>	<u>CPU-Burst</u>
A	6
B	5
C	3
D	4

If we use Round-Robin scheduling algorithm , Compute average waiting time and average turnaround time having quantum time 3ms.
7. Define Deadlock. Write down the necessary conditions for occurring a deadlock. $2 + 3 = 5$
8. Describe different CPU-scheduling criteria's. 5
9. Write short note on:-
i)PCB ii) CPU-scheduler $2.5*2=5$

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MID SEMESTER EXAMINATION 2022
SEMESTER III
B.Sc. COMPUTER SCIENCE HONOURS
Core Course V

Full Marks: 25

Time: 1 hour

. B.:

- Draw diagrams whenever necessary.
- Numbers to right indicate marks.

Answer any five (5) questions from the following:

$5 \times 5 = 25$

1. What are the advantages and disadvantages of Linked List? What are the advantages and disadvantages of Array? Why data structure is needed? 2+2+1
2. Write a C function to insert a node after a specific node in a single linked list, also define the node structure. 5
3. What are the advantages of circular doubly linked list over circular linked list? Is it possible to create a linked list with the help of array? Justify our answer. 2+3
4. What is the utility of NULL pointer in a linked list? Write down a code segment to create a 5D array of $2 \times 4 \times 3 \times 3 \times 5$ size and store auto generated data into it. 1+4
5. Write a C program to reverse an array with the help of a stack created using an array. 5
6. How to check the overflow and underflow condition of a stack using linked list? Write a function in C to insert a node at the beginning of a double circular linked list, also define the node structure. Consider the starting point of the linked list is not global. 2+3
7. Consider a stack (size=10) in which TOP=4. Elements at present moment are - A, B, C, D, E. Now perform the following. Show all steps. (a) Push(F) (b) Pop() (c) Pop(), (d) Add G (e) Pop(), (f) Add H (g) 4 times Pop(), (h) Peek() 5
8. Convert the following infix expression to postfix expression using stack showing all the steps:
$$(a+b)*c*d/f+(m*e)^g^r$$
 5

**RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE, RAHARA
KOLKATA**
MID SEM EXAMINATION 2021
B.Sc. 3rd SEM COMPUTER SCIENCE (Hons.)
Data Structures (CC5)

Total Marks: 25

Duration: 1 hour

N. B.:

- Draw diagrams whenever necessary.
- Numbers to right indicate marks.

Answer any five (5) questions from the following:

$5 \times 5 = 25$

1. What do you understand by data structure? Write two disadvantage of linked list over array? Why a node definition should be self-referential structure? $1+2+2=5$
2. Specify the condition with a piece of code to reach to the last & first node of a circular single list. State the difference between (ptr!=NULL) & (ptr->next!=NULL) in terms of singly linked list. $3+2=5$
3. What do you mean by overflow and underflow? Write down a code segment to create a 4D array of $4 \times 3 \times 3 \times 5$ size and store auto generated data to it. $1+4=5$
4. Why there is no concept of circular stack? What is the utility of a starting pointer in a linked list? What are the advantages of 2D array over 1D array? $2+2+1=5$
5. Write a piece of code to add a node at the beginning of a circular linked list and display it. 5
6. Convert the following infix expression to postfix expression using stack:
 $X+Y*Z-A/B^C*D^E$ 5
7. Write down the basic structure of the doubly linked list and a function to sort the list. 5
8. Write down a piece of code to show the push, pop, and peek functions of stack using singly linked list. 5

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MID SEMESTER EXAMINATION 2022
SEMESTER III
B.Sc. COMPUTER SCIENCE HONOURS
Core Course VII

Full Marks: 25

Time: 1 hour

Answer any five (5) questions taking at least two (2) from each group:

$5 \times 5 = 25$

Group-A

1. (i) Compare between Baseline Wandering and DC component problem.
(ii) How many channels are used to create Group, Super group, Master group and Jumbo group in Analog hierarchy of FDM? (3+2)
2. Explain Synchronous data Transmission and Asynchronous data Transmission. (5)
3. Draw the structure of Optical Fibre and explain its working. (5)
4. Assume that a voice channel occupies a bandwidth of 4 kHz. You need to combine three voice channels into a link with a bandwidth of 12 kHz, from 22 to 34 kHz. Show the configuration, using the frequency domain. Assume there are no guard bands. (5)

Group-B

5. i) A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is $x^3 + 1$. What is the actual bit string transmitted?
ii) Suppose the third bit from the left is inverted during transmission. How will receiver detect this error? (2+3)
6. (i) State differences between dynamic and static routing.
(ii) Describe elements of Layered Network Architecture. (2+3)
7. (i) Compare features between connectionless and connection-oriented services.
(ii) Describe count-to-infinity problem. (2+3)
8. Take a real life example of OSI reference model. Explain the processes linking with its layers (with diagram). (5)

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**END SEMESTER EXAMINATION 2022
SEMESTER III
B.Sc. COMPUTER SCIENCE HONOURS**

Core Course V

Full Marks: 50

Time: 2 hours

N. B.:

- Draw diagrams whenever necessary.
- Numbers to right indicate marks.

Answer any five (5) questions from the following:

$5 \times 10 = 50$

1. What do you understand by data structure? Let there is an integer 2D array of size 4x5. Assuming each integer takes 4 bytes of memory and the base address is 1018, consider the values are stored in row major ordering, with proper diagrammed explanation find out address of the element A[2][4]. Which one is better and why: recursive version or non-recursive version of a function? Linked list is not a non-linear data structure-Explain it with example. $2 + 4 + 2 + 2$
2. What are the advantages and disadvantages of using a linked list over an array? How will you represent the polynomial $7x^6 + 5x^3 - 2x + 10$ using linked list? Write an algorithm/function to reverse the direction of links of a given singly linked list. Write an algorithm/function to delete an element from the beginning of a doubly linked list. $2 + 2 + 4 + 2$
3. Explain the overflow condition of a deque (implemented using array). Write a C function to insert a new element at the beginning of a deque, considering that the deque has been implemented using array. Explain how to use a deque as stack. $3 + 5 + 2$
4. Write down the basic properties of a recursive function. Write a C program to print the resultant matrix where you need to use the following formula to compute each element of the resultant matrix.

$$f(x,y) = 4x \text{ Minimum}\{A(x,y), A(x,y+1), A(x+1,y+1), A(x+1,y)\}$$

Here A is the input matrix and $f(x,y)$ is the element of the resultant matrix. If values are not available then treat them as zeros.

Write down C functions to check queue full and to display the circular queue elements using array. $2 + 5 + 3$
5. What is the main advantage of selection sort over bubble sort? Write a C program to sort the elements of a single linked list.

Which one will be efficient to implement binary search: linked list or array? Justify your answer with example(s). 1 + 5 + 4

6. Explain binary search tree with the help of an example? Write an algorithm/function for searching a given element in a binary search tree, if the element is not present, your algorithm/function should insert it in the tree so that it remains a binary search tree. What is the advantage of storing elements in binary search tree? (3 + 5) + 2
7. Write a function to find the minimum value of a binary search tree(BST). Insert the following data into an empty BST - 40, 25, 70, 22, 35, 60, 80, 90, 10, 30. Delete the following data from the BST: 30, 80, 40. Show all the steps. What is balance factor of a binary tree? 3 + 5 + 2
8. What is the precondition of performing binary search in an array? Write an algorithm/function to search an element in an array using binary search method. Write an algorithm/function to search and insert an element in a hashed table where collisions are resolved by linear probing with open addressing. What is the drawback of this algorithm function? (1 + 4) + (4 + 1)

RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE, RAHARA, KOLKATA**End Semester Examination 2019****Semester III****B.Sc. Computer Science Honours****Core Course VI****Full Marks: 50****Time: 2 hours****Attempt any five questions:** **$5 \times 10 = 50$**

1. What are the main functions of Operating System? Explain the process life cycle with a suitable diagram. $4 + 6 = 10$
- 2.
- a) Why thread is called a ‘lightweight’ process?
 - b) What do you mean by context switch?
 - c) What is the difference between job-scheduler and CPU scheduler? Why are they termed as long-term scheduler and short-term scheduler respectively?
 - d) What is the role of dispatcher?
- $2 + 2 + 4 + 2 = 10$
- 3.
- a) Consider the following set of processes:

Process	Arrival Time	Burst Time
P1	4.0	7
P2	3.0	10
P3	0.0	14
P4	2.0	9

Draw the Gantt chart for non-preemptive SJF and preemptive SJF (Shortest Remaining Time First) scheduling and calculate the average waiting time and average turnaround time for the both.

- b) “RR scheduling with large quantum becomes FCFS” – Explain.
- c) Name two scheduling algorithms in which starvation may occur and explain the reason behind the starvation.

 $6 + 2 + 2 = 10$

4. What is mutual exclusion? Explain the solution of Producer Consumer Problem with binary semaphore. $2 + 8 = 10$
5. What are the major functions of Memory Management?
Distinguish between internal fragmentation and external fragmentation with suitable example. Explain Compaction. $3 + 4 + 3 = 10$
6. Find the number of page faults using FIFO and OPTIMAL page replacement policy for the reference string:
7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1 with 3 page frames. $5 + 5 = 10$

7.

- a) What is the advantage of segmentation over paging?
- b) Difference between dynamic loading and dynamic linking.
- c) Explain the role of associative memory in paging.
- d) What is thrashing? How can it be handled?

$$2 + 2 + 2 + 4 = 10$$

8.

- a) Consider the following five-process system and find if any safe sequence is possible with available resources A=3, B=2, C=2, using Banker's algorithm:

Process	Allocation			Max		
	A	B	C	A	B	C
P1	0	1	0	7	2	3
P2	2	0	0	3	0	2
P3	3	0	2	9	2	2
P4	2	1	1	2	3	2
P5	0	0	2	4	1	3

- b) Discuss the limitations of banker's algorithm.

$$7 + 3 = 10$$

9. Write short notes on: (Any two)

$$5 + 5 = 10$$

- a) Real time scheduling
- b) Inter process communication
- c) Conditions for deadlock
- d) File allocation methods
- e) Cryptography in operating system protection mechanism

RAMAKRISHNA MISSION
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END SEMESTER EXAMINATION 2022
 SEMESTER III

SEC-I: Value Education & Indian Culture

Full Marks: 25

Time: 1 hour

Answer the following questions mentioning five distinct points in support of your answer: (in only five sentences)

$$5 \times 5 = 25$$

1. Write how the Self-Assessment of your Personality Traits has helped you.
2. ‘Great work requires great and persistent effort for a long time. Neither need we trouble ourselves if a few fail. It is in the nature of things that many should fall, that troubles should come, that tremendous difficulties should arise, that selfishness and all the other devils in the human heart should struggle hard when they are about to be driven out by the fire of spirituality. The road to the Good is the roughest and steepest in the universe. It is a wonder that so many succeed, no wonder that so many fall. Character has to be established through a thousand stumbles.’ – in support of the statement of Swami Vivekananda express your own views.
3. Write salient points from “Atmavikas” (Our Educational Needs) of Swami Premeshanandaji Maharaj.
4. Write in your own words about the main features of any one Yoga.
5. SOCIAL VALUES are one of the instrumental values of a human being for enlightened citizenship. Write how you are trying to express it in your life.

End Semester Examination 2019**B.Sc. Semester -III****SEC-I: Value Education & Indian Culture****Full Marks: 25****Time: 1 hour**

Answer the following questions mentioning five distinct points in support of your answer: (in only five sentences)

$$5 \times 5 = 25$$

1. ‘We are what our thoughts have made us; so take care of what you think. Words are secondary.’ – in support of the statement of Swami Vivekananda express your own views.
2. Write on the significance of any one ‘Subhashita’ which has impressed you.
3. Write in your own words about the main features of any one Yoga.
4. SOCIAL VALUES are one of the instrumental values of a human being for enlightened citizenship. Write how you are trying to express it in your life.
5. Write salient points from “Atmavikas” (Our Educational Needs) of Swami Premeshanandaji Maharaj.

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**END SEMESTER EXAMINATION 2022
SEMESTER III
B.Sc. COMPUTER SCIENCE HONOURS**

Core Course VI

Full Marks: 50

Time: 2 hours

Answer any five questions:

$5 \times 10 = 50$

1. a) What happens in context switch?
 b) Differentiate among job queue, ready queue and device queue.
 c) Explain each of the situations when a process switches from running state to ready state.
 d) What are the advantages of multithreading instead of multiple processes?

$2 + 3 + 2 + 3$

2. a) What is the difference between CPU-scheduler and job scheduler?
 b) Explain how priority scheduling causes starvation. Suggest a solution for that.
 c) What is the difference between turnaround time and response time?
 d) What happens if time quantum is very large in case of RR scheduling?

$2 + (2 + 2) + 2 + 2$

3. a) Differentiate between preemptive and non-preemptive scheduling with examples.
 b) Consider a system with the following information

Process	Burst Time
P1	12
P2	10
P3	3
P4	9

Draw the Gantt chart and calculate the average waiting time and turnaround time for each of the following:

- i) FCFS scheduling ii) RR scheduling (quantum =3)

$3 + (3 + 4)$

4. a) Explain busy waiting in the context of semaphore and give a solution for it.
 b) Consider four holes of size 220KB, 410 KB, 120KB and 200 KB in that order. Three processes P1, P2, and P3 of sizes 180KB, 200KB and 150 KB are arriving in the memory for allocation in the respective order. Find out the memory allocation following the first-fit, best-fit and worst-case strategies.

$(2 + 3) + 5$

5. a) What will happen if each of the necessary conditions of deadlock is denied to avoid deadlock?
 b) Explain safe state in Banker's algorithm with an example.

- c) Consider a system with the following information:

Process	Allocation			Max		
	A	B	C	A	B	C
P1	0	0	1	0	0	1
P2	1	0	0	1	7	5
P3	1	3	5	2	3	5
P4	0	6	3	0	6	5

Find the need matrix and find the safe sequence, if any, with available resources as:
 A=1, B=5, C=2.

3 + 2 + 5

6. a) What is the difference between logical address and physical address?
 b) Why does page table is kept in associative memory?
 c) Explain the function of Memory Management Unit (MMU), preferably with an example.
 d) What is the difference between paging and segmentation?

2 + 3 + 3 + 2

7. a) What is Belady's anomaly?
 b) Consider the following page reference string:-

1 2 3 4 1 2 5 1 2 3 4 3

Find how many page fault occurs for the following page replacement techniques if number of frames =3.

- i. FIFO
- ii. LRU
- iii. Optimal page replacement

1 + (3 × 3)

8. a) Write short notes on any two of the following.
 b) Process Control Block (PCB).
 c) Comparison among contiguous file allocation, indexed file allocation and linked file allocation.
 d) Internal fragmentation vs. external fragmentation.
 e) Deadlock detection and recovery.

2 × 5 = 10

9. Write short note:
 a) C-LOOK
 b) C-SCAN

5 + 5

10. a) Consider the following:-

Process	Arrival time	CPU burst
P0.	0.0	8
P1.	0.4	4
P2.	1.0	1

Calculate average waiting time & average turnaround time.

- b) What is TLB?
 c) What is Aging?

6 + 2 + 2 = 10

1. Answer any eight (8) questions from the following : $1 \times 8 = 8$

- i) Datagram networks are sometimes referred to as connectionless, because
 - a) there is no physical link between nodes,
 - b) the switch does not keep information about the connection state,
 - c) packets are lost frequently during communication,
 - d) None of the above.

- ii) To overcome the limitations of the crossbar switch, which is necessary-
 - a) multistage switch
 - b) multi-space switch
 - c) crosstalk switch
 - d) All of the above.

- iii) Data Link Layer divides the stream into data units called
 - a) Frames
 - b) Packets
 - c) Frames and Packets
 - d) None of the above

- iv) IGMP is responsible
 - a) to send datagrams.
 - b) for transmission of a message to a group of recipients.
 - c) for error free transmission
 - d) all of the above.

- v) In line coding system, the best case is, when we need
 - a) maximum signal rate.
 - b) minimum signal rate.
 - c) both (a) and (b)
 - d) None of the above.

- vi) If S is the number of signal element, then
 - a) $S=C \times N \times r$
 - b) $S=C/(N \times r)$
 - c) $S=C \times N/r$
 - d) None of the above

- vii) In character oriented framing, if the text contains one or more escape characters followed by a byte with the same pattern as the flag, then the escape characters marked by another
 - a) Flag
 - b) Header
 - c) Trailer
 - d) ESC

- viii) Ring Network is suitable for
 a) wireless communication
 b) optical fibre communication
 c) co-axial cable communication
 d) None of the above
- ix) What is the bit rate for FHD (Full High Definition) TV?
 a) 15Gbps (Approx.)
 b) 20Gbps (Approx.)
 c) 1.5Gbps (Approx.)
 d) None of the above
- x) In a three stage switch, the total number of crosspoints is
 a) $2kN + k(N/n)^2$
 b) $2kN$
 c) $(kN)^2$
 d) None of the above
- xi) QAM combines:
 a) ASK and FSK
 b) ASK and PSK
 c) ASK, FSK and PSK
 d) None of the above
- xii) Process-to-Process delivery is the function of which layer?
 a) Network
 b) Data link
 c) Transport
 d) Physical
- xiii) Which of the following is an actual valid host for network 192.168.10.32/28?
 a) 192.168.10.37
 b) 192.168.10.47
 c) 192.168.10.54
 d) 192.168.10.12

Answer any three (3) questions from the following :

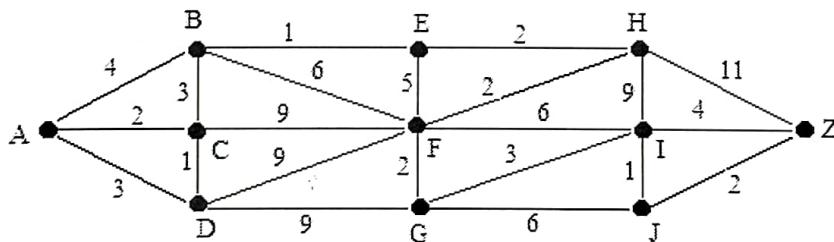
$4 \times 3 = 12$

2. What do you mean by
 i) Manchester coding and ii) Differential Manchester coding **$2 + 2$**
3. Draw the flow diagram of stop-and-wait protocol for
 i) the first frame is sent and acknowledged,
 ii) the 2nd frame is sent but lost, after time out it is resent,
 iii) the 3rd frame is sent and acknowledged, but the acknowledgement is lost. The frame is resent. **4**
4. a) What is the purpose of subnetting? Prove that following hosts are on different networks:
 (i) 19.16.1.1 /13 (ii) 19.15.1.1 /13
- b) A network (IP address: 10.10.0.0) has a subnet mask of 255.255.255.254. Determine maximum number of actual hosts in the network. What is the broadcast address of that network? **$3 + 1$**

5. i) State and explain the Nyquist Formula.
 ii) Determine the maximum (theoretical) limit of bit rate (in bits per second), in a noiseless channel, of a Bandwidth of 5000Hz transmitting 64levels. $2 + 2$
6. How many bytes of data can be sent in 15 seconds over a serial link with baud rate of 96000 in asynchronous mode with odd parity and two stop bits in the frame? 4

Answer any three (3) questions from the following : $10 \times 3 = 30$

7. a) What is DNS?
 b) Mention the four layers of TCP/IP reference model.
 c) Compare and contrast in between TCP/IP reference model with OSI reference model.
 d) Compare between logical addressing and physical addressing. $1 + 1 + 4 + 4$
8. a) Explain with proper diagram, the functionality of send window and receive window of Go-Back-N protocol.
 b) Explain bit oriented framing and character oriented framing. $6 + 4$
9. a) How cable TV works for data transfer?
 b) Explain the working of Cyclic Redundancy Check (CRC) encoder and decoder.
 c) If the codeword **1101110** is transmitted and **1000110** is received, then explain the functionality of CRC decoder circuit to detect the existence of that error. $2 + 4 + 4$
10. a) What are the key characteristics of Virtual Circuit Network?
 b) Explain three phases of circuit-switched network.
 c) What is a Hub? $4 + 4 + 2$
11. a) State basic differences between TCP and UDP.
 b) Compare IPv4 and IPv6.
 c) Write down the Dijkstra's shortest Path Algorithm and illustrate the same on the following example.



$2 + 2 + (4 + 2)$

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MID SEMESTER EXAMINATION 2021
THIRD SEMESTER
B.Sc. COMPUTER SCIENCE HONOURS
CORE COURSE VI

Full Marks: 25**Time: 1 hour****N. B.:**

- Draw diagrams whenever necessary.
- Numbers to right indicate marks.

Answer any five (5) questions from the following: **$5 \times 5 = 25$**

- 1) What is an operating system? What are the functions of an operating system? What are the different operating systems? $1+2+2=5$
- 2) Describe the objective of multi-programming. What is a time-sharing system? What are the advantages of a multiprocessor system? $1+2+2=5$
- 3) What is the kernel of the operating system? What types of kernel modules are used in an operating system? What is the shell? $1+3+1=5$
- 4) What are the differences between kernel space and user space? What are hybrid kernels? Describe microkernel architecture in brief. $2+1+2=5$
- 5) What is a system library? What is a system call? What types of system calls are used in an operating system? $1 + 1 + 3 = 5$
- 6) How did the system call work? What are the differences between kernel mode and user mode? What is spooling? $2+2+1=5$
- 7) What is the process? How process to load and execute in the main memory? What is the process control block (PCB)? $1+2+2=5$
- 8) What is the process life cycle? What is process scheduling? Write the important process scheduling queues. $1+1+3=5$

Answer 5 out of 9 questions. **$5 \times 10 = 50$ Marks**

1. Define linear and non-linear data structures.

Write an algorithm to convert an Infix Expression to an equivalent Postfix Expression.

Convert the following Arithmetic Infix Expression into its equivalent Postfix form:

$$(F + G) * C - ((A + B) - (D - E)) \quad (2+6+2)$$

2. What are Advantages and Disadvantages of using a Linked List over an Array?

How will you represent the polynomial $4x^3 - 10x^2 + 3$ using a Linked List?

Write an algorithm to delete an element from the beginning of a Doubly Linked List.

Write an algorithm to concatenate two existing circular lists. $(2+2+2+4)$

3. Write a program to implement Singly Linked List using templates. Also design functions for insertion, deletion and search of a number. $(4+2+2+2)$

4. What is a Priority Queue? What operations does it support? Explain in detail Heap Data Structure that is used to implement Priority Queue covering MinHeap. $(2+2+6)$

5. What is Recursion? Explain internal stack implementation using recursive factorial function. Explain linear, binary, and multiple recursions. $(2+3+5)$

6. What is a tree traversal? Write preorder, inorder, and post-order tree traversal algorithms for a Binary Tree, with illustrations. $(1+3+3+3)$

7. What is the precondition of performing binary search in an array? Write a non-recursive algorithm to search an element in an array using binary search method. What is the time complexity of it? What is the advantage of using binary search method over linear search method?

What is the best case time complexity of an insertion sort algorithm? When does it occur?

$$(1+4+1+2) + (1+1)$$

8. How does an AVL tree differ from a Binary Search Tree?

Construct an AVL Tree by inserting the following set of nodes:

B, W, M, T, R, J, D, S, Q, K, V, P

State at each step balanced or unbalanced, if unbalanced, rotation type.

What is the maximum height of an AVL Tree with n number of nodes? $(2+6+2)$

9. What is Hash Data Structure? Explain in detail methods followed in Hash Collision Handling. $(3+7)$
