

SEAL

R/A/S/M/EXAM.
2021

120098

TECHNICAL PAPER
(Computer Science / Application)

Time : 3 hours]

[Full Marks : 200

PART—I

(Marks : 40)

Notes : (i) Answer **all** questions.

(ii) Each question carries **2** marks.

1. Give two differences between HDD and SSD storage.
2. The main memory address of a computer consists of 10 bits. How many addressable memory locations are there in the memory?
3. Some types of memory are : main memory, secondary memory, cache memory. Order them in the increasing order of their access speed.
4. Convert the following infix expression to a prefix expression :

$$(X - Y) + (W / Z) * T$$

5. Suppose, *best-fit* is used for dynamic memory allocation and there are n blocks (nodes) of free space in the available list. What is the minimum number of blocks that will be examined in search for a free block for allocation?
6. Suppose, *first-fit* is used for dynamic memory allocation and there are n blocks (nodes) of free space in the available list. What is the minimum number of blocks that will be examined in search for a free block for allocation?

R/A/S/M/EXAM. 2021/111

SEAL

SEAL

7. What is the number of edges in a spanning tree of a connected graph with n nodes?
8. What is the number of nodes in a full binary tree of height k ? Assume that a binary tree consisting of only one node is of height 0.
9. Assume a linked list representation, in which a node is represented by a structure consisting of three fields : data, flink and blink, where flink and blink are pointers to the next and previous node respectively. Let n be the node pointed to by p and assume that there are many nodes before and after n . Which is the node pointed to by the following?
- $p \rightarrow \text{flink} \rightarrow \text{blink} \rightarrow \text{flink} \rightarrow \text{blink}$
10. With respect to asymptotic notations of an algorithm, which of the following is true?
- $n^3 + 4n^2 + 2 = \underline{\hspace{2cm}}$.
- (i) $\theta(n)$
- (ii) $O(n^2)$
- (iii) $O(1)$
- (iv) $O(n^3)$
11. The maximum number of edges that a connected undirected graph of n vertices is given by a function $f(n)$, where $f(n) = \underline{\hspace{2cm}}$.
12. State the difference between white box and black box software testing.
13. What is the difference between a compiler and an interpreter?
14. In the UNIX Operating System, which method is used to handle deadlocks?

15. Under which condition is the existence of a cycle in the resource allocation graph, a necessary and sufficient condition for the existence of a deadlock?
16. Which is the page replacement algorithm that suffers from Belady's Anomaly?
17. Draw the truth table for the following Boolean expression :

$$\bar{X}Y + YZ$$

18. With the help of a diagram, illustrate implementation of the following Boolean expression using NAND gates :

$$\bar{X}Y$$

19. Give the SQL syntax for creating a relational table.
20. What is a foreign key in a relational table?

PART—II

(Marks : 160)

- Notes :** (i) Answer **all** questions.
(ii) Each question carries **20** marks.

21. Explain the following Object-Oriented Programming Concepts with the help of an example each : 4×5=20
- (a) Abstract data type
 - (b) Data encapsulation
 - (c) Operator overloading
 - (d) Multiple inheritance
 - (e) Virtual function
22. (a) Explain the *wait* (also known as *P*) and *signal* (also known as *V*) atomic functions of a *semaphore*. What is the difference between a counting semaphore and a binary semaphore? 3+2=5