

SEAL

**R/C/P/EXAM
2021**

150090

**TECHNICAL PAPER
(Computer Science / Application)**

Time : 3 hours]

[Full Marks : 100

PART—I

(Marks : 20)

- Notes :** (i) Answer **all** questions.
(ii) Each question carries **1** marks.

1. Write a significant difference between combinational circuit and sequential circuit.

2. Consider the following statements :

Statement-I : Running time of heap sort is better than that of insertion sort, in worst case.

Statement-II : An in-order traversal of the Binary Search Tree (BST) will return all of the values in ascending order.

Which of the above statement/s is/are TRUE?

3. If the address bus size of a microprocessor is 16 bits, how many unique addresses can it cater service to?

SEAL

SEAL

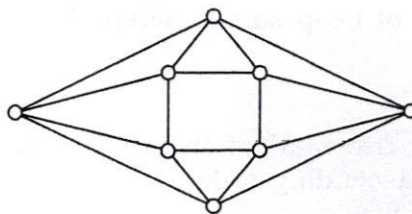
4. What is the outcome of the following program segment in C?

```
int main()  
{  
    int i, j, k;  
    i=2;  
    j=++i;  
    k=i++;  
    printf("%d %d %d", i, j, k);  
}
```

5. Arrange the following time complexities in ascending order.

$O(1)$, $O(n)$, $O(n \log 2n)$, $O(n!)$, $O(2n)$, $O(\log 2n)$, $O(n^2)$

6. In which layer of network architecture, the Secured Socket Layer (SSL) is used?
7. What is the minimum number of colours required to colour the following graph, such that no two adjacent vertices are assigned the same colour?



8. What do you mean by the following C statement?

```
Ptr=(int*) malloc(40 * sizeof(int));
```

9. How is an automatic variable different from static variable in C++?

10. Which of the following statements is/are TRUE?
- (i) A hash function takes a message of arbitrary length and generates a fixed length code.
 - (ii) A hash function takes a message of fixed length and generates a code of variable length.
11. Convert the decimal number $(50)_{10}$ into its binary equivalent.
12. What is semaphore?
13. In software engineering, test cases should uncover which of the following errors?
- (A) Non-existent loop termination
 - (B) Comparison of different data types
 - (C) Incorrect logical operators or precedence
 - (D) All of the above
14. Find the output of the following C procedure for $n=25$:
- ```
Void fun2(int n)
{
 if(n==0)
 return;
 fun2(n/2);
 printf("%d", n%2);
}
```
15. Exclusive-OR (XOR) logic gates can be constructed from what other logic gates?
16. What are the ACID properties in DBMS?

17. The in-order and preorder traversal of a binary tree are  $d b e a f c g$  and  $a b d e c f g$  respectively. What will be the post-order traversal of the binary tree?
18. A subnet has been assigned a subnet mask of 255.255.255.192. What is the maximum number of hosts that can belong to this subnet?
19. Consider a memory system which is byte addressable. A program, of size 20 bytes, is stored in the memory and the address of the first byte is 40CC. What will be the address of the last location?
20. What do you mean by *polymorphism* in C++?

## PART—II

(Marks : 80)

**Notes :** (i) Answer **all** questions.  
(ii) Each question carries **10** marks.

21. (a) Consider a four-way *set-associative* cache (initially empty) with total 16 cache blocks. The main memory consists of 256 blocks and the request for memory blocks are in the following order :

0, 255, 1, 4, 8, 134, 160, 1, 216, 129, 63, 8, 48, 32, 73, 92

Which of the respective memory blocks will **not** be in cache if LRU page replacement policy is employed?

5

- (b) How is *pipelining* performed in a processor? Briefly discuss the pipeline hazards taking one example for each.

2+3=5

22. (a) Consider an array with elements 12, 35, 83, 98, 23, 45, 78, 94, 105 as the input to the *binary search* procedure. Determine the lower bound, upper bound of each subproblem and subsequent middle indices in order to search the element 94.

6

- (b) Differentiate between depth-first search and breadth-first search with an example.

4



23. Using K-maps, find the minimal Boolean expression of the following Sum Of Product (SOP) and Product Of Sum (POS) representations :

$$f(w, x, y, z) = \Sigma(1, 3, 4, 6, 9, 11, 14, 15)$$

$$f(w, x, y, z) = \Pi(1, 4, 5, 6, 11, 12, 13, 14, 15)$$

24. (a) Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Is this system deadlock-free? Why or why not? 2+4=6
- (b) Describe the fundamental differences between a paged system and a segmented system. 4
25. (a) Explain various types of list in HTML. Write codes to demonstrate their usages. 3+3=6
- (b) What is the difference between `.call()` and `.apply()` in JavaScript? 4
26. How is Boyce-Codd normal form (BCNF) different from third normal form (3NF)? Explain with an example. 10
27. (a) Explain the CSMA/CD mechanism with a suitable flow diagram. What is the objective of jam signal in this mechanism? 4+1=5
- (b) A network using CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time (including the delays in the devices and ignoring the time needed to send a jamming signal) is 25.6  $\mu$ s, what is the minimum size of the frame? 5
28. (a) Explain the basic, intermediate and detailed COCOMO model with an example. 6
- (b) Highlight the differences between software verification and software validation. 4