R/A/PR EXAM. 2021

TECHNICAL PAPER

(Computer Science / Application)
(Optional Technical)

Time : 3 hours] [Full Marks : 100

PART—I

(Marks : 20)

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

(ii) Each question carries **1** mark.

1. Write C statements to exchange two variables without using a temporary variable.

2. Which of the following statement(s) is/are true?

(a) The changes in formal parameters are not reflected in actual parameters in the case of pass by the value parameter passing.

(b) A function in C cannot return multiple values straightaway.

3. What is the difference between static RAM and dynamic RAM?

4. Consider the following recursive function fun(x, y) :

```
int fun(int x, int y)
{
    if(x == 0)
        return y;
    return fun(x - 1, x + y);
}
```

What is the value of fun (4, 3)?

5. How is dynamic programming different from greedy approach of algorithm design?

6. A series of Undo/Redo operations in MS-Excel or MS-Word best corresponds to which data structure?

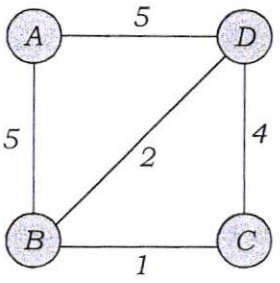
   (a) Stack

   (b) Queue

   (c) Linked list

   (d) None of the above

7. Identify a minimum spanning tree in the following graph :



8. Differentiate between malloc and realloc dynamic memory allocation functions.

9. What is friend function in C++?

10. In operating system, what do you mean by critical section?

11. Convert the decimal number $(50)_{10}$ into its hexadecimal equivalent.

12. What do you mean by virtual memory?

13. Determine the postfix equivalent of the infix expression $A * B \wedge C + D$.

14. Differentiate between relational data model and object-oriented data model.

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15. What is the maximum height of an AVL tree with 7 nodes?

16. What is the purpose of Hamming code in computer networks?

17. What do you mean by MAC address?

18. Why is normalization required in DBMS?

19. The following numbers are inserted into an empty Binary Search Tree (BST) in the given order :

10, 1, 3, 5, 15, 12, 16

Construct the BST.

20. If the sequence of operations – push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), pop are performed on a stack, what will be the sequence of popped out values? Assume that push inserts an element into the stack and pop removes an element from stack top.

PART—II

(Marks : 80)

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

(ii) Each question carries **10** marks.

21. *(a)* Consider a machine with byte addressable main memory of 216 bytes and block size of 8 bytes. Assume that a direct mapped cache consisting of 32 lines is used with this machine.

(i) How is 16 bit memory address divided into tag, line number and byte number?

(ii) Into what line would the byte with address $(C334)_{16}$ be stored?

(b) Compare and contrast the features of RISC and CISC.

22. *(a)* Write a program in C/C++ to implement a stack using a singly linked list. Use three user defined functions push (int) and pop() and display() in main() function for insertion, deletion and print operation respectively.

(b) How is a Max-Heap tree different from Binary Search Tree? Explain.

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

$f(w, x, y, z) = \Sigma (1, 3, 4, 5, 7, 8, 9, 11, 15)$

$f(w, x, y, z) = \Pi (0, 4, 5, 7, 8, 9, 13, 15)$

24. What are the differences between user-level and Kernel-level threads? Under what circumstances is one type better than the other? What is the essential cause of the difference in cost between a context switch for Kernel-level threads and a switch that occurs between user-level threads?

25. Write a program in C++ to Add Two Time Objects by using the objects as function arguments. Each object has three components, namely hours, minutes and seconds. If object T1 is 2 hours, 45 minutes and 30 seconds and object T2 is 3 hours, 20 minutes and 40 seconds, then the resultant object should be 6 hours, 6 minutes and 10 seconds.

26. Describe the difference between the first normal form (1NF), second normal form (2NF) and third normal form (3NF) with an example.

27. *(a)* Discuss the datagram format of IPV4 protocol with appropriate schematic diagram. Also, mention the advantages of IPV6 over IPV4.

(b) A multiplexer combines four 100-kbps channels using a time slot of 2 bits. Show the output with four arbitrary inputs. What is the frame rate? What is the frame duration? What is the bit rate? What is the bit duration?

28. *(a)* Differentiate between white box testing and black box testing. Why is integration testing harder than unit testing?

(b) Explain the role of coupling and cohesion with respect to modular design.