Discrete Mathematics and Applications(18IT C05) – UNIT II

Short Answer Questions

1. Find formulae for the following sequence   [CO2][R]

   What is the value of $\sum_{k=4}^{8}(-1)^k$?

2.

3. Define Mathematical Induction   [CO2][R]

4. Define Strong Induction   [CO2][R]

5. What is meant by Recursively Defined Functions and illustrate   [CO2][R]
   With example.

6. Recall the Recursive Definition of Full Binary Trees.   [CO2][R]

7. How many one-to-one functions are there from a set with
   m elements to one with n elements?

8. Outline the number of bit strings of length eight either start with a 1 bit or   [CO2][U]
   end with the two bits 00?

9. Recall Pigeonhole Principle and illustrate with example.   [CO2][R]

10. Among 100 people relate , how many are were born in the same   [CO2][U]
    month in the least case.

11. Show how many permutations of the letters *ABCDEFGH* contain the   [CO2][U]
    string *ABC* ?

12. A group of 30 people have been trained as astronauts to go on the first   [CO2][U]
    mission to Mars. How many ways are there to select a crew of six people
    to go on this mission.

13. Infer the coefficient of $x^{12}y^{13}$ in the expansion of $(x + y)^{25}$?   [CO2][U]

14. Infer the next larger 4-combination of the set $\{1, 2, 3, 4, 5, 6\}$ after   [CO2][U]
    $\{1, 2, 5, 6\}$

Long Answer Questions

15. Briefly explain Proof Strategies and illustrate with examples.   [CO2][U]

16. Let P (n) be the statement that $1^2 +2^2+3^2 + \ldots\ldots+ n^2 = n(n + 1)(2n + 1)/6$ [CO2][AN]
    for the positive integer n
    Test for the above statement P(n) using Mathematical Induction.

17. Model the recursive definition of a^n where a is a nonzero real number   [CO2][AP]
    and n is a nonnegative integer

18. If T is a full binary tree T , then $n(T) \leq 2^{h(T)+1} - 1$ [CO2][AP]

    Solve the above inequality using structural induction

19. Recall the following Recursive Algorithms and Illustrate with Example.   [CO2][R]

a) Computing n!
b) Computing a^n
c) Computing gcd (a, b)
d) Modular Exponentiation
e) Linear Search
f) Binary Search
g) Merge Sort

20. Each user on a computer system has a password, which is six to eight characters   [CO2][U]
    long, where each character is an uppercase letter or a digit. Each password must
    contain at least one digit. Summarize , How many possible passwords are there?

21. Infer the no of bit strings of length four that do not have two consecutive 1s?   [CO2][U]

22. Identify how many solutions does the equation   [CO2][AP]
    $x1 + x2 + x3 = 11$ have, where x1, x2, and $x3$ are nonnegative integers?

23. Identify how many different strings can be made by reordering the letters of the   [CO2][AP]
    word SUCCESS?

24. Infer how many ways are there to place 10 indistinguishable balls into eight   [CO2][U]
    distinguishable bins?

25. Identify how many ways are there to put four different employees into three   [CO2][AP]
    indistinguishable offices, when each office can contain any number of employees?

26. Develop the permutations of the integers 1, 2, 3 in lexicographic order   [CO2][AP]