Question Bank

1) The contrapositive of p→q is

2) The proposition p^(q^~q) is

3) (S,<=) is a Poset iff

4) A non empty subset of N contains

5) If p: "anil is rich" and q: " Kanchan is poor" them the symbolic form of the statement " Either Anil or Kanchan is rich"

6. Determine whether the following are tautology, contradiction or neither:
   [p→(q^r)]↔[(p→q)^(p→r)]

7. Show that (D(24),|) [where D(N) means factors of N] represents a Poset. Draw its
 Hasse Diagram.

8. Let A = { a,b,c,d}. For each of the following define a relation R on A which satisfies:
   Symetric but not reflexive and not transitive.

Explain with a suitable example the Topological Sort. Also write its algorithm. Explain Lattice with a suitable example.
6. If you are eligible for admission then you must be under 25 and if you are not under 25 then you do not qualify for a scholarship. Therefore if you qualify for a scholarship, you are eligible for admission.

7)Let A be any set of propositions not all have the same truth values. Define a relation on A by
   pRq iff p→q is true. Which of the 4 properties are satisfied?

8) Let A= { n€Z : 2<=n <=12} . A poset on A defined as aRb iff either (a divides b) or (a is prime and a<b). Draw the hasse diagram and find least element and maximal element.

9) Find the number of combinations of 10 items taking from five x's, four y's, five z's, and

seven w's.

10) State and prove inclusion-exclusion principle for two sets. Write down the xpression for PIE for 4 sets, A, B,C and D.

11) State pigeonhole principle. Suppose that a patient is given a prescription of 45 capsules with the instructions to take at least one capsule per day for 30 days. Then prove that there must be a period of consecutive days during which the patient takes exactly 14 capsules

12) Solve using generating function $a_n = 6a_{n-1} - 9a_{n-2}$ where $a_0 = 2, a_1 = 3$

13) Find the generating function for the numeric sequence $\{1^2, 2^2, 3^2, \dots \dots \}$

14) Prove that any sequence of six integers must contain subsequence whose sum is divisible by six.

15) The generating function corresponding to the sequence 1,1,0,1,1,1,1…….. is

22) If N={1,2,3,…..} be ordered by divisibility which one of the following subsets of N is not total ordered?

23) The number of ways 10 people can seat in a row so that a certain pair of them are next to each other is

24) The number of non-negative integral solutions of the equation $x_1 + x_2 + x_3 = 10$ is

25) The number of different outcomes that are possible by tossing 10 similar coins is

26) If N={1,2,3,…..} be ordered by divisibility which one of the following subsets of N is not total ordered?

27) The number of ways 10 people can seat in a row so that a certain pair of them are next to each other is

28) The number of different outcomes that are possible by tossing 10 similar coins is

29) (a) If $gcd(a, b) = c$ prove that $gcd(a^2, b^2) = c^2$

(a) If $gcd(a, b) = 1$, then prove that $gcd(2a + b, a + 2b) = 1 \ or \ 3$.

30) Let S be a square where each side has length 2 inches. Find the minimum number of points to be chosen from the interior of S such that the distance between two of the points will be less than $\sqrt{2}$ inches.

31). Find the number of combinations of 10 items taking from five x's, four y's, five z's, and seven w's.

32). Solve using generating function $a_n = 6a_{n-1} - 9a_{n-2}$ where $a_0 = 2, a_1 = 3$

33). Find the generating function for the numeric sequence $\{1^2, 2^2, 3^2, \dots \dots \}$

34). Prove that any sequence of six integers must contain subsequence whose sum is divisible by six.

35). State division algorithm. Show that every square integer is of the form 5k, $5k \pm 1$ for some integer k.

40) Find two integers u and v satisfying $63u + 55v = 1$

41) State pigeonhole principle. Suppose that a patient is given a prescription of 45 capsules with the instructions to take at least one capsule per day for 30 days. Then prove that there must be a period of consecutive days during which the patient takes exactly 14 capsules

42). Find the number of natural numbers not greater than 1000 which are not divisible by 3,5 or 7.

43). How many integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where each $x_i \geq 2$?

44) Solve using generating function $a_n = 6a_{n-1} - 9a_{n-2}$ where $a_0 = 2, a_1 = 3$

45) Find the generating function for the numeric sequence $\{1^2, 2^2, 3^2, \dots \dots \dots\}$

46) Prove that any sequence of six integers must contain subsequence whose sum is divisible by six.

47) State division algorithm. Show that every square integer is of the form 5k, $5k \pm 1$ for some integer k.