QUESTION BANK

UNIT I

ANSWER THE FOLLOWING

1) A = { $m \in z|\ m = 6r + 12\ for\ some\ integer\ r$ } &
   B = { $m \in z|\ m = 3s\ for\ some\ integer\ s$ }. Prove that $A \subseteq B$.
2) Given S = {a, b, c}, T = {b, c, d}, W = {a, d}. Find $S \times T \times W$

3) Let U = {1, 2, ……, 9} be the universal set. E = { 2, 4, 6, 8}, F = {1, 5, 9}
   Find 1) $E \oplus F$ 2) E^C 3) F^C 4) F - E
4) Let S = {a, b, c, d, e, f, g}. Determine which of the following are partitions of S:
   (a) P1 = [{a, c, e}, {b}, {d, g}] (b) P2 = [{a, e, g}, {c, d}, {b, e, f }],
   (c) P3 = [{a, b, e, g}, {c}, {d, f }], (d) P4 = [{a, b, c, d, e, f , g}].
5) Let R and S be the following relations on B = {a, b, c, d}
   R = {(a, a), (a, c), (c, b), (c, d), (d, b)} and S = {(b, a), (c, c), (c, d), (d, a)}
   Find the following composition relations: (a) R ◦ S (b) S ◦ R.
6) Let A = {1, 2, 3}, B = {a, b, c} & C = {x, y, z}. Consider the following relations R & S from A to B & From B to C resp.
   R = {(1, b), (2, a), (2, c)} and S = {(a, y), (b, x), (c, y), (c, z)}
   Find the matrices M_R, M_S & $M_R . M_S$
7) Prove $7^n - 2^n$ is divisible by 5, for all n ∈ N.
8) Let P be the proposition that the sum of the first n odd numbers is n^2; that is,
   P (n) : 1 + 3 + 5 +⋯+ (2n − 1) = n^2.
9) Consider the following five relations on the set A = {1, 2, 3}:
   R = {(1, 1), (1, 2), (1, 3), (3, 3)} S = {(1, 1)(1, 2), (2, 1) (2, 2), (3, 3)}
   A × A = universal relation, T = {(1, 1), (1, 2), (2, 2), (2, 3)}, ∅ = Empty Relation
   Determine whether or not each of the above relations on A is transitive.

UNIT II

ANSWER THE FOLLOWING

1) Evaluate: (a) log_2 8 (b) log_2 64 (c) log_{10} 100 (d) log_{10} 0.001 (e) log_{10} 0.01.

2) There are 35 lottery tickets numbered from 1 to 35. One of them is drawn at random
   What is the probability that the number on it is multiple of 5 or 7.

3) If the chances of A winning a race is $\frac{1}{6}$ & the chance of B winning it is $\frac{1}{8}$.
What is the chance that neither should win? Atleast one will win?

4) The probability that John hits a target is p = $\frac{1}{4}$. He fires n = 6 times.
Find the probability that he hits the target: (a) exactly two times (b) more than four times.

5) A box contains 2 white, 3 red & 4 green balls of identical size, we draw 3 balls
Find the probability that a) all are green b) atmost one is green.

6) A box contains 36 tickets numbered 1 to 36. One ticket is drawn at random.
Find the probability that the number on the ticket is either divisible by 3 or is a perfect square.

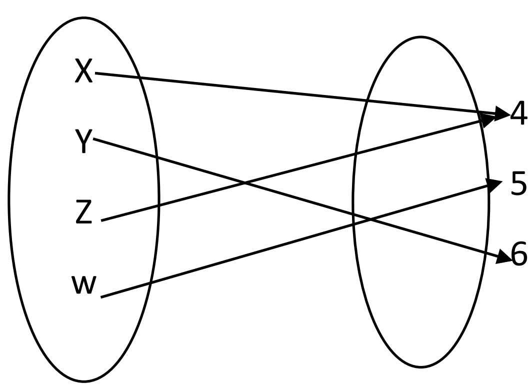
7) A family has six children. Find the probability p that there are:
(a) three boys and three girls; (b) fewer boys than girls. Assume that the probability of any particular child being a boy is $\frac{1}{2}$.

8)Consider the permutation σ = $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 5 & 6 & 1 & 3 & 4 \end{pmatrix}$ &

τ = $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 4 & 3 & 1 & 2 & 5 \end{pmatrix}$

in S_6. Find (a) composition σ ∘ τ; (b) σ^{-1}.

9) Let the functions g: B → C be defined by . Determine if each function is:
(a) onto, (b) one-to-one, (c) invertible.



10) If X = number on the uppermost face of a cubic die. Find E(X) & V(X).

11) Find :- a) 25 (mod 7) b) -35 (mod 11) c) -3 (mod 8) d) 29 (mod 6)

e) 25 (mod 7)

UNIT III

ANSWER THE FOLLOWING

1) Each student in Liberal Arts at some college has a mathematics requirement A & a science requirement B. A poll of 140 students shows that: 60 completed A, 45 completed B, 20 completed both A and B.
find the number of students who have completed At least one of A and B.

2) Construct the tree diagram that gives the permutations of {a, b, c}

3) Explain Arithemetic Progression & Give an example.

4) Consider the second-order homogeneous recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with initial conditions $a_0 = 2$, $a_1 = 7$
(a) Find the next three terms of the sequence. (b) Find the general solution

5) A 5 digit number is to be formed using the digits from 0 to 9. How many such number can be formed, if
a) The digits are distinct b) Repetition of digits is allowed.

6) construct the pascal's triangle for n = 5.

7) A history class contains 8 male students and 6 female students. Find the number n of ways that the class can select: (a) 1 class representative (b) 2 class representatives, 1 male and 1 female (c) 1 president and 1 vice president

8) Find the number m of positive integers not exceeding 1000 which are not divisible by 3, 7, or 11.

9) Consider the following homogeneous recurrence relation: $a_n = 6a_{n-1} - 9a_{n-2}$ with initial conditions $a_1 = 3$, $a_2 = 27$
(a) Find the next three terms of the sequence. (b) Find the general solution

10) From 5 professors & 7 students a committee of 4 is to be formed. In how many
ways this can be done if the committee contains at most 2 professors.

11) Suppose a set has 7 elements. find the number m of ordered partitions of S into three cells, say [A1, A2, A3], so they contain 2, 3, and 2 elements resp

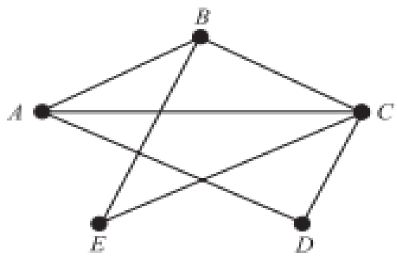
12) Explain Geometric Progression & Give an example.

13) Find the no. of words that can be formed when the letters of the words
a) COMMITTEE b) INDIFFERENCE.

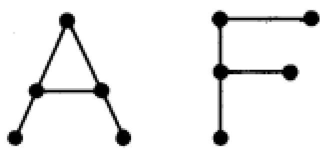
UNIT IV

ANSWER THE FOLLOWING

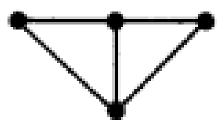
1) Consider the graph G. find the a) set V (G) of vertices of G and the set E(G) of edges of G (b) Find the degree of each vertex.



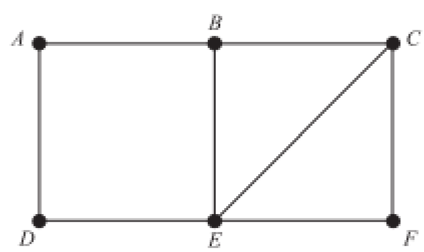
2) Check Whether the following graphs are isomorphic.



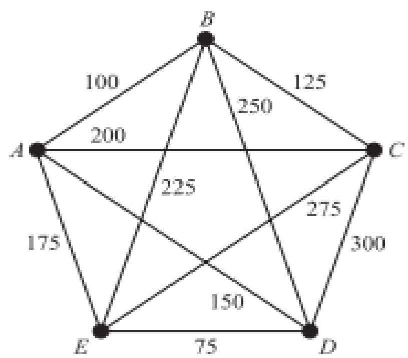
3) Find all spanning trees of the graph G.



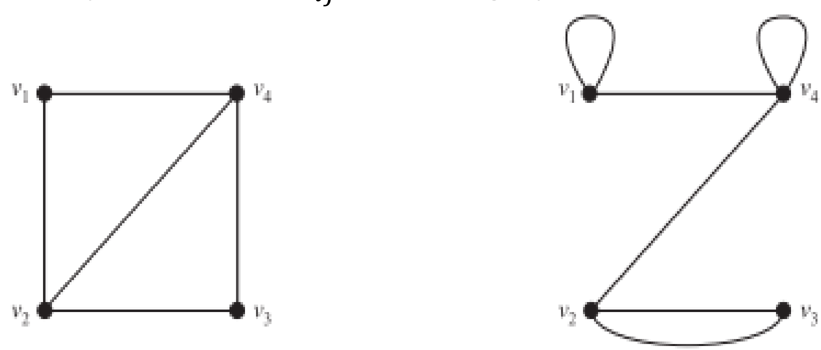
4) Consider the graph G. Find: (a) all simple paths from A to F (b) all trails from A to F



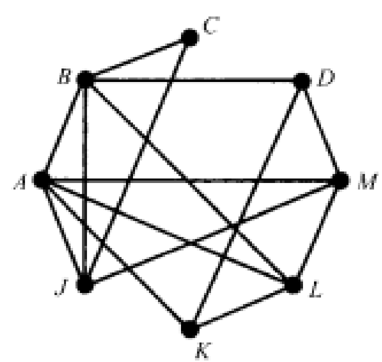
5) Apply the nearest-neighbour algorithm to the complete weighted graph G, beginning at: (a) vertex A (b) vertex D.



6) Find the adjacency matrix A = [a_{ij}] of each graph G.



7) Use the Welch-Powell algorithm to paint graph. Find the chromatic number n of the graph



8) Draw two 3-regular graphs with eight vertices

9) Find the number of trees with seven vertices.

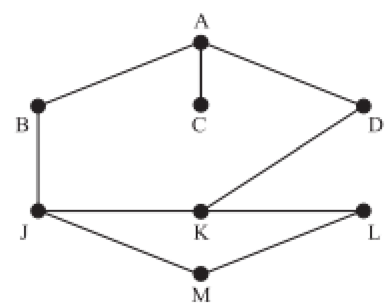
UNIT V

ANSWER THE FOLLOWING

1) Find the final tree T if the following numbers are inserted into an empty binary search tree T : 50, 33, 44, 22, 77, 35, 60, 40

2) Suppose the pre order traversals of a binary tree T yield the following sequences of nodes: Pre order: G, B, Q, A, C, K, F, P, D, E, R, H
Draw the diagram of T.

3) Beginning at vertex A and using a BFS (breadth-first search) algorithm, find the order
the vertices are processed for the graph G.



4) Construct a tree with prufer code: (6, 5, 6, 5, 1)

5) consider the sequences of characters with the frequencies of each character is as
follows. E = 10, I = 30, O = 5, P = 15, S = 20, T = 15, V = 5 . Find the Huffman coding tree.

6) Let A = {1, 2, 3, 4, 6, 8, 9, 12, 18, 24} be ordered by the relation “x divides y.”
Draw Hasse Diagram.

7) Consider the binary tree T. (a) Traverse T using the pre order algorithm.
(b) Traverse T using the in order algorithm.