ST. ANN'S COLLEGE OF ENGINEERING &TECHNOLOGY: CHIRALA

DEPARTMENT OF COMPUTERSCIENCE & ENGINEERING

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Regulation:R-13

Academic Year: 2016 -2017 **Year/Sem**: II B.Tech-I Sem

Faculty Name: Mr.J.Karthik **Branch/Sec**: CSE-'A & C'

FREQUENTLY ASKED QUESTIONS

UNIT-1

1. (a).Obtain the CNF of ~(PVQ) ↔ (P^Q)

   (b). Obtain the PDNF of (~P→R)^ (Q→P)

2. (a).Construct the truth table for ┐(PV(Q^R))↔((PVQ)^(PVR))

   (b).Define well formed Formula with examples.

3. Show that the following set of premises are inconsistent using indirect method of Proof: P→Q, Q→R, ~ (P^ R), PVR =>R.

4. (a) Prove that the proposition: (P→ Q)→ (P ^ Q) is a Contingency.

   (b) Obtain the principal disjunctive normal form of the propositional formula: (~ P → R) ^ (Q ↔ P).

5. Write the quantifiers of the following statements, where predicate symbols denotes, F(x): x is fruit, V(x): x is vegetable and S(x, y): x is sweeter than y.

   (a) Some vegetable is sweeter than all fruits

   (b) Every fruit is sweeter than all vegetables

   (c) Every fruit is sweeter than some vegetables

   (d) Only fruits are sweeter than vegetables.

6. (a) Show the implication: (P → Q) → Q ⇒ PV Q

   (b) Show that the proposition: (PV~ Q) ^ (~ PV~ Q) VQ is a tautology.

7. (a) How does an indirect proof technique differ from a direct proof?

   (b) Using predicate logic, prove the validity of the following argument:

   "Every husband argues with his wife. 'X' is a husband. Therefore, 'X' argues with his wife".

UNIT-2

1. Ifa, b, c, d, e, be consecutive integers then such that 5 divides one of these.
2. S.T for any integer n,n(n+1)(n+5) is a multiple of 3
3. If a,b are integers such that not both zeros the prove that $gcd(a^2,b^2)=gcd(a,b)^2$
4. Use Euclidean algorithm to find gcd(1819,3587) and gcd(12345,54321)
5. If 2n-1 is prime then show that n is prime.
6. State and prove Fermat's Theorem
7. State and prove Division Theorem
8. State and prove the Fundamental Theorem of Arithmetic
9. State and prove Euclidean algorithm

UNIT-3

1. (a).Explain and draw the Hasse diagram of: (P(S),≤),where P(S) is power set of the

Set S= {a, b, c}.

(b).find the inverse of f(x) = 10/ (7-3x).

2. (a). Let the relation R={(a, b)} on the set S={1,2,3,4,5} . Draw the Hasse Diagram? Whose Matrix $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$

(b). f(x)=2x, g(x)=x+10, h(x)=√(2x+3) verify (hog)of=ho(gof)

(c). f(x)=1/(2(x+1)) find the inverse function?

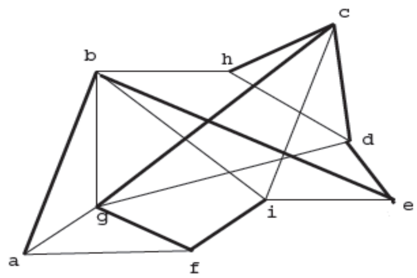
3. (a) What is a Poset? Draw the Hasse diagrams of all the lattices with 5 elements.

(b) Let A = {1, 2, 3}, B = {a, b, c} and C = {x, y, z}. The relation R from A to B is {(1, b), (2, a), (2, c)} and the relation S from B to C is {(a, y), (b, x),(c, y), (c, z)}. Find the composition relation, R?S.

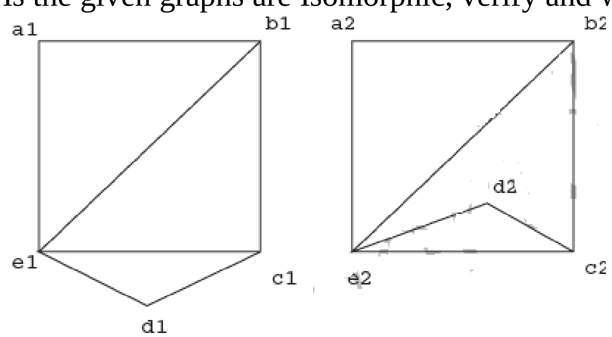
4. Let the relation R = {(1, 2), (2, 3), (3, 3)} on the set {1, 2, 3}. What is thetransitive closure of R?

UNIT-4

1.Find the order and size, And implement the prim’s algorithm for the given graph.



2. Is the given graphs are Isomorphic, verify and write the rules for Isomorphic.



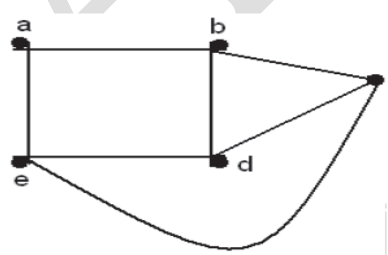
3. (a) Prove that a tree with n vertices has exactly n-1 edges.

(b) Show that graph G is a tree iff G is connected and contains no circuits.

(c) How many vertices will the following graph contain 16 edges and all verticesof degree 2.

4. (a) Write the algorithm for breadth first search spanning tree.

(b) Apply breadth first search on the following figure

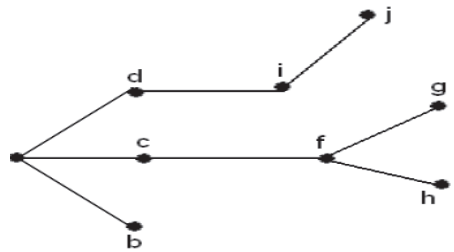


5. Determine the no of edges and vertices in Kn, Km,n, Cn, Pn, Wn.

6. (a) Let G = (V,E) be an undirected graph, with G1 = (V1,E1) a subgraph of G.

Under what condition(s) is G1 not an induced subgraph of G?

(b) For the graph shown in figure, find a subgraph that is not an induced graph.



7**.** (a) Give an example of a connected graph G where removing any edge of G resultsin a disconnected graph.

(b) Give an example for a bipartite graph with examples.

(c) Discuss graph coloring problem with required examples.

8. (a). Write the difference between Hamiltonian graphs and Euler graphs.

(b). Write the rules for constructing Hamiltonian paths and cycles.

9. (a) Suppose that we know the degrees of the vertices of a non directed graph G.Is it possible to determine the order and size of G? Explain.

(b) Suppose that we know the order and size of a non directed graph G. Is itpossible to determine the degrees of the vertices of G? Explain.

UNIT-5

1. Define relation and explain the properties of Binary relation with examples.

2. What is an Algebraic structure? Explain semi group and monad with examples.

3. (a).Prove that the set Z of all integers with the binary operation a * b = a + b+ 1, 8 2 Z is an abelian group.

(b). Explain, in detail, the algebraic systems: endomorphism and automorphism with suitable examples.

4. Prove that the intersection of two submonoids of a monoid is a monoid.

5.Show that the function f from (N, +) to (N, *), where N is the set of all naturalnumbers, defined by $f(x) = 2^x \ \forall x \in N$.

6. Consider the group, G = {1, 2, 4, 7, 8, 11, 13, 14} under multiplication modulo 15:

(a) Construct the multiplication table of G.

(b) Find the values of: 2^{-1}, $7^{-1}$and 11^{-1}.

(c) Find the orders and subgroups generated by 2, 7, and 11.

7. There are 21 consonants and 5 vowels in the English alphabet. Consider only 8- letter words with 3 different vowels and 5 different consonants.

a).how many of such words can be formed.

b).how many begin with **a** and end with **b**

c).how many contain the letters **a, b**&**c**.

8. (a). Find the number of 5-digit integers that contain the digit 6 exactly once.

(b). 5 red pens, 2 black pens and 3 blue pens are arranged in a row. If the pens of the same color are not distinguishable, how many different arrangements are possible?

9. A group of 8 scientists is composed of 5 psychologists and sociologists:

(a) In how many ways can a committee of 5 be formed?

(b) In how many ways can a committee of 5 be formed that has 3 psychologistsand 2 sociologists?

10. (a) In how many ways can we draw a heart or spade from ordinary deck of playingcards? a heart or an ace? an ace or a king? A card numbered 2 through 10?

(b) How many ways are there to roll two distinguishable dice to yield a sum thatis divisible by 3?

11.How many anagrams (arrangements of letters) are there of {7.a, 5.c, 1.d, 5.e, 1.g,1.h, 7.i, 3.m, 9.n, 4.o, 5.t}?

12.How many arrangements are there of 8.a, 6.b, 7.c in which each ‘a’ is on atleast one side of another ‘a’.?

UNIT-6

1. $x_n - x_{n-1}$=1/(n(n+1)), n≥1, x0=1.

2. x_n --3 x_{n-1} =0, n≥1, x4=81.

3. (a) Define recurrence relation? show that the sequence {an} is a solution of recurrence relation an = -3 an−1 + 4 an−2 if an = 1.

(b) What is solution of the recurrence relation an = an−1 + 2 an−2 with a0 = 2 and a1 =7?

3. Find a general expression for a solution to the recurrence relationan - 5 an−1 + 6 an−2 = n(n-1) for n>=2.

4. (a) Find a recurrence relation for number of ways to climb n stairs if the personclimbing the stairs can take one,two,or three stairs at a time.

(b) What are the initial conditions? How many ways can this person climb a flightof eight stairs?

5. (a) In how many ways can Traci select n marbles from a large supply of blue, redand yellow marbles(all of the same size) if the selection must include an evennumber of blue ones.

(b) Determine the sequence generated by f(x) =1/(1-x) + 3x^7 -11.