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Lecture Plan 1

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic :-** Introduction to discrete structure	**Time Allotted(min):-**
1.	Introduction Discrete structure consists of mathematical planning of various types of problems. Like functions, sets, relations, trees, permutation combination, recurrence relation, algebraic structure, graph, Boolean algebra and operations of sets are discussed. Like union, intersection, difference, symmetric difference etc.	10
2	Division of the Topic Sets Functions Relations	30
3.	Conclusion Discrete structure consists of mathematical planning of various types of problems. Like functions, sets, relations, trees, permutation combination, recurrence relation, algebraic structure, graph, Boolean algebra and operations of sets Like union, intersection, difference, and symmetric difference are the basic operations on the sets	5
4	Question / Answer ▪ Discuss the various available operations on set.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan 2

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic :-** Duality principle, finite and infinite sets, power set	**Time Allotted(min):-**
1.	Introduction Duality principle is concerned with the sets according to which if U, ∩, Φ are replaced by ∩, U, U (universal set) then the result will be same. The set with a countable no. of elements is called as a finite set and a set with infinite no. of elements is called as an infinite set. The power set is a set that contains all possible no. of subsets of the given set. And a Φ set is the subset of each and every set.	10
2	Division of the Topic Duality principle finite and infinite sets power set	30
3.	Conclusion Hence it is seen that according to duality principle if we change the union, intersection, empty set by the intersection, union and universal sets the result will be unaltered. And a set with countable number of elements is called as finite set and if the number of elements are infinite than the set is called as infinite set. And a set of all possible sub sets of a given set is called power of a set.	5
4	Question / Answer ▪ If A={ r ,s} then find out P(A) ▪ Discuss duality principle ▪ Discuss null and empty set	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan 3

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic: -** Multi sets and Cartesian product.	**Time Allotted(min):-**
1.	Introduction As according to the definition of set the set is a collection of distinct elements of same type. And no repetition of elements is allowed. But in case of multi sets the elements can occur in the set more than one time. The Cartesian product of two sets A and B are defined as a collection of all ordered pairs of the form of (a, b) where first element belongs to set A and second belongs to set B.	10
2	Division of the Topic Multi sets Cartesian product.	30
3.	Conclusion In case of multi sets the elements can occur in the set more than one time. The Cartesian product of two sets A and B are defined as a collection of all ordered pairs of the form of (a, b) where first element belongs to set A and second belongs to set B.	5
4	Question / Answer ▪ Explain Multi set ▪ .Explain Cartesian product.	5

Assignment to be given:- NIL

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan 4

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic: -** Representation of sets and relations.	**Time Allotted(min):-**
1.	Introduction A set is defined as a collection of distinct objects of same type or class of objects. The objects of a set are called elements of members of the set. The set can be formed by two ways. 1. Tabular form of asset as P = {a ,b ,c ,d} 2. builder form of a set as P = {x: x Є N, x is a multiple of 3} Let P and Q be two non-empty sets. A binary relation R is defined to a subset of P x Q from a set P to Q. If (a ,b) Є R and R is subset of P x Q. Then a is related to b by R. That is aRb.	10
2	Division of the Topic Representation of sets. Representation of relations.	30
3.	Conclusion A set is defined as a collection of distinct objects of same type or class of objects. The objects of a set are called elements of members of the set. The set can be formed by two ways. 3. Tabular form of asset as P = {a ,b ,c, d} 4. builder form of a set as P = {x: x Є N, x is a multiple of 3} Let P and Q be two non-empty sets. A binary relation R is defined to a subset of P x Q from a set P to Q . If (a ,b) Є R and R is subset of P x Q. Then a is related to b by R. That is aRb.	10
4	Question / Answer NIL	0

Assignment to be given:- NIL

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan 5

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Unit:-I**

S. No.	**Topic: -** Types of relations.	**Time Allotted(min):-**
1.	Introduction The relations are of many types like reflexive, symmetric, anti symmetric and transitive relation. A relation R is said to be reflexive if for all a ЄA there must exist (a, a) type of ordered pairs in R. A relation R is said to be symmetric if there exist (a, b) type of ordered pair in R than (b, a) must be there in R. anti symmetric relation is a relation in which if (a, b) type of ordered pair is there than (b, a) belongs to it iff a=b. A relation R is said to be transitive if (a, b) and (b, a) type of ordered pairs in R than (a, c) must also be in R.	10
2	Division of the Topic Reflexive relation Symmetric relation Anti symmetric relation Transitive relation	30
3.	Conclusion A relation R is said to be reflexive if for all a ЄA there must exist (a, a) type of ordered pairs in R. A relation R is said to be symmetric if there exist (a, b) type of ordered pair in R than (b, a) must be there in R. anti symmetric relation is a relation in which if (a, b) type of ordered pair is there than (b, a) belongs to it iff a=b. A relation R is said to be transitive if (a, b) and (b, a) type of ordered pairs in R than (a, c) must also be in R.	5
4	Question / Answer Discuss the following: ▪ Reflexive relation ▪ Symmetric relation ▪ Anti symmetric relation ▪ Transitive relation	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision :00

Lecture Plan 6

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic: -** Equivalence relation.	**Time Allotted(min):-**
1.	Introduction A relation R is said to be equivalence if it holds the properties of reflexive, symmetric and transitive relations. Means it must hold the all three relations properties.	5
2	Division of the Topic Equivalence relation.	30
3.	Conclusion A relation R is said to be equivalence if it holds the properties of reflexive, symmetric and transitive relations. Means it must hold the all three relations properties. i.e (a, a) Є R, (a, b) ,(b ,a) ЄR and (a, b) ,(b ,c),(a ,c) Є R	10
4	Question / Answer ▪ Let S be a set of all points in a plane. Let R be a relation such that for any two points a and b ; (a ,b) Є R if b is within two centimeters from a. Show that R is an equivalence relation.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision :00

Lecture Plan 7

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic: -** Partitions, partial ordering Relations and Lattices.	**Time Allotted(min):-**
1.	Introduction A partition of a set A is a set of nonempty subsets of A denoted $\{a_1, a_2 \ldots\ldots\ldots a_k\}$ such that a)every element of A belongs to one of A_j. b) If A_i and A_j are distinct then A_i U A_j = Φ. A relation R on set A is called partial order relation if it satisfy the following conditions Relation R is reflexive, anti symmetric and transitive. Partial order set is said to be a Lattice, every two elements in the set have a unique least upper bound and a unique greatest lower bound	10
2	Division of the Topic Partitions Partial ordering Relations Lattices.	30
3.	Conclusion A partition of a set A is a set of nonempty subsets of A denoted $\{a_1, a_2 \ldots\ldots\ldots a_k\}$ such that a)every element of A belongs to one of A_j. b) If A_i and A_j are distinct then A_i U A_j = Φ. A relation R on set A is called partial order relation if it satisfy the following conditions Relation R is reflexive, anti symmetric and transitive. Partial order set is said to be a Lattice, every two elements in the set have a unique least upper bound and a unique greatest lower bound	5
4	Question / Answer ▪ Explain Partitions ▪ Explain partial ordering Relations ▪ Explain Lattices	5

Assignment to be given:- NIL

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision :00

Lecture Plan 8

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic: -** Compositions of relations and functions.	**Time Allotted(min):-**
1.	Introduction Consider a relation R from A to B and S from B to C. The composition of relation R and S denoted by ROS is the relation from A to C. Consider a function f: A →B & g: B →C .The composition of f with g is a function from A in to C defined by (g o f) (x) = g [f(x)] and denoted by g o f.	10
2	Division of the Topic Compositions of relations Compositions of functions.	30
3.	Conclusion Consider a relation R from A to B and S from B to C. The composition of relation R and S denoted by R o S is the relation from A to C. R o S ={ (a ,c) : (a ,b) Є R & (b ,c) Є S for some b Є B Consider a function f: A →B & g: B →C .The composition of f with g is a function from A in to C defined by (g o f) (x) = g[f(x)] and denoted by g o f.	5
4	Question / Answer ▪ P = { x,y,z}, Q= { a,b,c}, R = { p, q, r } and f: P→Q such that f= {(x, a),(y ,b),(z, c)}, g: Q→R such that g={(a, p),(b, q)} Find out fog.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan 9

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- A**

S. No.	**Topic: -** Cardinality of functions, inverse of function.	**Time Allotted(min):-**
1.	Introduction The cardinality of a function is the number of unique function defined from set A to B. A function f: A →B is invertible if and only if it is a bijective function. science f is bijective there fore each element of A corresponds to a distinct element of B. also there is no element of B is not the image any element of A i.e range equals to co-domain B. The inverse of f for f exist if inverse of is a function from B to A.	10
2	Division of the Topic Cardinality of functions Inverse of function	30
3.	Conclusion A function f: A →B is invertible if and only if it is a bijective function. science f is bijective there fore each element of A corresponds to a distinct element of B. also there is no element of B is not the image any element of A i.e range equals to co-domain B	5
4	Question / Answer ▪ Explain what you mean by cardinality of a function. ▪ P = { x,y,z}, Q= { a,b,c} and f: P→Q such that F= {(x, a),(y b),(z, c)} Find out f -1	5

Assignment to be given:- Ist assignment will be given

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan 10

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- B**

S. No.	**Topic: -** Introduction to algebraic structure.	**Time Allotted(min):-**
1.	Introduction If there exist a system such that it consists of a non- empty set and one or more operations on that set then that system is called an algebraic system. It is generally denoted by (A, op1, op2, op3……op_n), where A is a non-empty set and op_1……..op_n are operation on A. The basic properties of binary operation are closure, associative, commutative, identity, inverse, distributive and idempotent.	10
2	Division of the Topic Introduction to algebraic structure.	30
3.	Conclusion If there exist a system such that it consists of a non- empty set and one or more operations on that set then that system is called an algebraic system. It is generally denoted by (A, op1, op2, op3……op_n), where A is a non-empty set and op_1……..op_n are operation on A. The basic properties of binary operation are closure, associative, commutative, identity, inverse, distributive and idempotent.	10
4	Question / Answer NIL	0

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan 11

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- B**

S. No.	**Topic :-** Definition and examples of monoid and semi group	**Time Allotted(min):-**
1.	Introduction Let (A,*) be an algebraic system, where * is a binary operation on A. (A,*) is called monoid if the following conditions are satisfied: 1 * is closed operation 2 * is associative operation 3 There exists an identity element with respect to the operation * Let (A,*) be an algebraic system, where * is a binary operation on A. (A,*) is called semi group if the following conditions are satisfied: 1 * is closed operation 2 * is associative operation	10
2	Division of the Topic Definition and examples of monoid Definition and examples of semi group	30
3.	Conclusion Let (A,*) be an algebraic system, where * is a binary operation on A. (A,*) is called monoid if the following conditions are satisfied: 1 * is closed operation 2 * is associative operation 3 There exists an identity element with respect to the operation * Let (A,*) be an algebraic system, where * is a binary operation on A. (A,*) is called semi group if the following conditions are satisfied: 1 * is closed operation 2 * is associative operation	5
4	Question / Answer ▪ Explain difference between monoid and semi group.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan-12

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- B**

S. No.	**Topic: -** Definition of Isomorphism, Automorphism, Ring.	**Time Allotted(min):-**
1.	Introduction Two algebraic systems (A, *) and (B,+)are said to be isomorphic if we can obtain (B,+)from (A,*)by renaming the elements or operator in A,*. An isomorphism from an algebraic system (A,*) to (B,+)is called an auto orphism on(A,*) if F (a)=B F(b)=C and F(c)=B Let (A,+,*) be an algebraic system, where * and + are binary operation on A. (A,+, *) is called ring if the following conditions are satisfied: 1 (A,+) is an abelian group 2 (A,*) is a semi group 3 The operation * is distributive over the operation + .	10
2	Division of the Topic Isomorphism, Ring Auto orphism.	30
3.	Conclusion Two algebraic systems (A, *) and (B,+)are said to be isomorphic if we can obtain (B,+)from (A,*)by renaming the elements or operator in A,*. An isomorphism from an algebraic system (A,*) to (B,+)is called an auto orphism on(A,*) if F (a)=B F(b)=C and F(c)=B Let (A,+,*) be an algebraic system, where * and + are binary operation on A. (A,+, *) is called ring if the following conditions are satisfied: 1 (A,+) is an abelian group 2 (A,*) is a semi group 3 The operation * is distributive over the operation + .	5
4	Question / Answer Define Isomorphism, Automorphism, and Ring.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan -13

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- B**

S. No.	**Topic :-** Definition of Homomorphism, Subgroup and Normal subgroup	**Time Allotted(min):-**
1.	Introduction Let (A,*)and(B,+) be two algebraic systems and F be a function from A to B such that for any a_1 and a_2 in A F $(a_1 * a_2)$ =f (a_1) + f (a_2) Is called homomorphism. Let us consider (A,*) also S is a subset of A, Then (S,*) is called subgroup if it satisfy the following conditions: 1 * is closed operation 2 * is associative operation 3 There exists an identity element with respect to the operation * 4. For every element a Є S, a – 1 also Є S Let H be a subgroup of G. H is said to be normal subgroup if for any element A in G the left coset A * H = right coset H* A	10
2	Division of the Topic Homomorphism Subgroup Normal subgroup	30
3.	Conclusion Let (A,*)and(B,+) be two algebraic systems and F be a function from A to B such that for any a_1 and a_2 in A F $(a_1 * a_2)$ =f (a_1) + f (a_2) Is called homomorphism. Let us consider (A,*) also S is a subset of A, Then (S,*) is called subgroup if it satisfy the following conditions: 1 * is closed operation 2 * is associative operation 3 There exists an identity element with respect to the operation * 4. For every element a Є S, a – 1 also Є S Let H be a subgroup of G. H is said to be normal subgroup if for any element A in G the left coset A * H = right coset H* A	5
4	Question / Answer ▪ Define Homomorphism, Subgroup and Normal subgroup	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -14

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- B**

S. No.	**Topic: -** Cyclic group and Generating set.	**Time Allotted(min):-**
1.	Introduction Let (A,*) be an algebraic system. * is any closed operation and B = {a1, a2, a3…..} be a subset of A. Let B_1 denote the subset of A which contains B as well as the elements A_i * A_j for all $_{Ai}$'S and $A_{j's}$ belongs to B. B_1 is called the set generated by D. Similarly B_2 denote the set directly by B_1 and B_{i+1} is set generated by B_i. Let B * denote the union of B_1, B_2….. the algebraic system (B* , *)is called the subsystem generated by B. Thus for a group (A,*) if (B,*) is finite, (B*,*) is a subgroup and if B * = A , the B is called generating set and a group that has generating set consisting of a single element is known as cyclic group.	10
2	Division of the Topic Cyclic group Generating set	25
3.	Conclusion Let (A,*) be an algebraic system. * is any closed operation and B = {a1, a2, a3…..} be a subset of A. Let B_1 denote the subset of A which contains B as well as the elements A_i * A_j for all $_{Ai}$'S and $A_{j's}$ belongs to B. B_1 is called the set generated by D. Similarly B_2 denote the set directly by B_1 and B_{i+1} is set generated by B_i. Let B * denote the union of B_1, B_2….. the algebraic system (B* , *)is called the subsystem generated by B. Thus for a group (A,*) if (B,*) is finite, (B*,*) is a subgroup and if B * = A , the B is called generating set and a group that has generating set consisting of a single element is known as cyclic group.	10
4	Question / Answer Define Cyclic group and Generating set.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan -15

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- B**

S. No.	**Topic: -** Definition of Cosets and Langrage Theorem.	**Time Allotted(min):-**
1.	Introduction Let (G,*) be group and (H,*) be any subgroup of (G,*). If any element a ЄG then the set H*a=>Ha={ ha: h ЄH} is then coset of H in G generated by a. According to langrage Let H be a subgroup of a group G .then the right coset form a partition of G	10
2	Division of the Topic Definition of Cosets Langrage Theorem	30
3.	Conclusion Hence according to above discussion Let (G,*) be group and (H,*) be any subgroup of (G,*). If any element a ЄG then the set H*a=>Ha={ ha: h ЄH} is then coset of H in G generated by a. According to langrage Let H be a subgroup of a group G .then the right coset form a partition of G.	5
4	Question / Answer Let (I,+) is a group where I is the set of all integers and + is an addition operation and let H = {…..,-4,-2,0,2,4,6,8,….} be the subgroup consisting of multiples of 2. Determine all the left cosets of H in I.	5

<u>Assignment to be given:-</u> 2nd assignment will be given
<u>Reference Readings</u>:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision: 00

Lecture Plan -16

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- C**

S. No.	**Topic :-** Introduction to Recurrence Relation and Difference equation	Time Allotted(min):-
1.	Introduction A recurrence relation is a functional relation between the independent variable x, dependent variable f (x) and differences of various order of f(x). A recurrence relation is also called a difference equation and we will use these two terms interchangeably.	10
2	Division of the Topic Introduction to Recurrence Relation Difference equation	35
3.	Conclusion A recurrence relation is a functional relation between the independent variable x, dependent variable f (x) and differences of various order of f(x). A recurrence relation is also called a difference equation and we will use these two terms interchangeably.	5
4	Question / Answer NIL	0

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision :00

Lecture Plan -17

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- C**

S. No.	**Topic: -** Sequence, linear Recurrence Relation with constant coefficients. Recurrence and Recursion Relation Polynomials and their solutions.	**Time Allotted(min):-**
1.	Introduction The equation is said to be linear homogeneous difference equation if and only if f(r) =0. it will be of order n and non-homogeneous if f(r) != 0 To find out the homogeneous solution of a given equation we put right hand side = 0 and the find out the roots of the equation. Particular solution of a recurrence relation depends upon the terms present on the right hand side, if it is linear, particular solution will also be linear, if it is constant, particular solution will also be constant, if it is quadratic, solution will also be quadratic.	10
2	Division of the Topic Sequence, linear Recurrence Relation with constant coefficients. Recurrence and Recursion Relation Polynomials and their solutions	35
3.	Conclusion The equation is said to be linear homogeneous difference equation if and only if f(r) =0. it will be of order n and non-homogeneous if f(r) != 0 To find out the homogeneous solution of a given equation we put right hand side = 0 and the find out the roots of the equation. Particular solution of a recurrence relation depends upon the terms present on the right hand side, if it is linear, particular solution will also be linear, if it is constant, particular solution will also be constant, if it is quadratic, solution will also be quadratic.	5
4	Question / Answer NIL	0

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Revision :00

Lecture Plan -18

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- C**

S. No.	**Topic: -** Homogenous and particular solution for difference equation.	**Time Allotted(min):-**
1.	Introduction To find out the homogeneous solution of a given equation we put right hand side = 0 and the find out the roots of the equation. Particular solution of a recurrence relation depends upon the terms present on the right hand side, if it is linear, particular solution will also be linear, if it is constant, particular solution will also be constant, if it is quadratic, solution will also be quadratic.	10
2	Division of the Topic Homogenous and particular solution for difference equation	30
3.	Conclusion To find out the homogeneous solution of a given equation we put right hand side = 0 and the find out the roots of the equation. Particular solution of a recurrence relation depends upon the terms present on the right hand side, if it is linear, particular solution will also be linear, if it is constant, particular solution will also be constant, if it is quadratic, solution will also be quadratic.	5
4	Question / Answer Find out Homogenous and particular solution for difference equation. ▪ $a_r-6a_{r-1}+8a_{r-2} = 0$ ▪ $a_r + a_{r-1} +a_{r-2} = 0$	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision :00

Lecture Plan -19

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- C**

S. No.	**Topic :-** Solution of a Recurrence Relation using Generating functions	**Time Allotted(min):-**
1.	Introduction Generating function is a method to solve the recurrence relations. In generating function, the generating functions are given for every sequence of a_r Substituting the corresponding generating function for general terms of sequence a_r and solving it we get the solutions for Recurrence Relation.	10
2	Division of the Topic Solution of a Recurrence Relation using Generating functions	30
3.	Conclusion Generating function is a method to solve the recurrence relations. In generating function, the generating functions are given for every sequence of a_r. Substituting the corresponding generating functions for general terms of sequence a_r and solving it we get the solutions for Recurrence Relation.	5
4	Question / Answer ▪ Solve the recurrence relation $A_{r+2} – 3a_{r+1} + 2a_r = 0$ By the method of generating functions with the initial conditions a0 = 2 and a1 = 3. Solve the recurrence relation $A_r-7a_{r-1} +10a_{r-2} = 0$ ▪ By the method of generating functions with the initial conditions a0 = 3 and a1 = 3	5

Assignment to be given:- 3rd assignment will be given.
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -20

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Directed and Undirected Graphs.	**Time Allotted(min):-**
1.	Introduction A directed graph G is defined as an ordered pair (V, E) where V is set of points called vertices and E, the set of edges. Each edge in the graph G is assigned a direction and is identified with an ordered pair (u,v), where u is the initial vertex and v is the end vertex. An undirected graph G consists of a set of vertices V, E set of edges, The edge set contains the unordered pair of vertices. If (u, v) Є E, then we say u and v are connected by an edge where u and v are the vertices of the set V.	10
2	Division of the Topic Directed Graph Undirected Graphs.	30
3.	Conclusion A directed graph G is defined as an ordered pair (V, E) where V is set of points called vertices and E, the set of edges. Each edge in the graph G is assigned a direction and is identified with an ordered pair (u, v), where u is the initial vertex and v is the end vertex. An undirected graph G consists of a set of vertices V, E set of edges, The edge set contains the unordered pair of vertices. If (u, v) Є E , then we say u and v are connected by an edge where u and v are the vertices of the set V.	5
4	Question / Answer ▪ Discuss directed and undirected graphs.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan -21

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic :-** Homomorphic and Isomorphic Graphs	**Time Allotted(min):-**
1.	Introduction Any given graph G we can obtain a new graph by dividing an edge of G with additional vertices. The two graphs G and G* are said to be Homomorphic if they can be obtained from the same graph isomorphic graph by the same method.. Graphs G(V,E) and G*(V*,E*) are said to be isomorphic if there exist one to one correspondence f :V →V* such that { u ,v} is an edge of G iff {f(u),f(v)} is an edge of G*.	10
2	Division of the Topic Homomorphic Graphs Isomorphic Graphs	30
3.	Conclusion Graphs G(V,E) and G*(V*,E*) are said to be isomorphic if there exist one to one correspondence f :V →V* such that { u ,v} is an edge of G iff {f(u),f(v)} is an edge of G*. The two graphs G and G* are said to be Homomorphic if they can be obtained from the same graph isomorphic graph by the same method.	5
4	Question / Answer ▪ Difference between Homomorphic and Isomorphic Graphs.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -22

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Sub graph, cut point, bridge.	**Time Allotted(min):-**
1.	Introduction Consider a graph G=G (V, E). A graph H =H (V', E') is called a sub graph of G if the vertices and edges of H are contained in the Vertices and edges of G. That is if V' is subset of V and E' is subset of E. Let G be a connected graph .A vertex v in G is called a cut point if G-v is disconnected. Let G be a connected graph .A edge e in G is called a bridge if G-e is disconnected.	10
2	Division of the Topic Sub graph cut point Bridge.	30
3.	Conclusion A graph H =H (V', E') is called a sub graph of G if the vertices and edges of H are contained in the Vertices and edges of G. That is if V' is subset of V and E' is subset of E .A vertex v in G is called a cut point if G-v is disconnected. Let G be a connected graph .A edge e in G is called a bridge if G-e is disconnected.	5
4	Question / Answer ▪ Explain cut point. ▪ Explain bridge. ▪ Explain sub graph.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -23

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Multi graph and weighted Graph.	**Time Allotted(min):-**
1.	Introduction A graph consists of two things A set V=V (G) whose elements are called vertices, nodes or points and a set E=E (G) of unordered pairs of distinct vertices called edges. If in a graph there is more than one edge between the two vertices or if the end point of an edge is same as its starting point than the graph is called multi graph.A graph G is called as weighted graph if each edge e of G is assigned a nonnegative number w (e) called a weight or length of v.	10
2	Division of the Topic Multi graph weighted Graph	30
3.	Conclusion If in a graph there is more than one edge between the two vertices or if the end point of an edge is same as its starting point than the graph is called multi graph. A graph G is called as weighted graph if each edge e of G is assigned a nonnegative number w (e) called a weight or length of v.	5
4	Question / Answer ▪ What is multi graph? ▪ What is weighted graph?	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -24

Faculty:- **Semester:-VI** **Class:-CSE-I** **Course Code:-CSE-203-E**

Subject:-Discrete Structure **Unit:-VI**

S. No.	**Topic: -** Path and Circuits, shortest path in weighted graph.	**Time Allotted(min):-**
1.	Introduction A path in a multi graph G consists of an alternating sequence of vertices and edges of the form v_0, $e_1 \ldots\ldots e_{n-1}.v_{n-1}.e_n$, v_n.. The number of edges is called the length of the path. And if the starting and ending points are same like v_0, $e_1 \ldots\ldots e_{n-1}.v_{n-1}.e_n$, v_n. v_0 called as circuit. The shortest path in a weighted graph is the path with minimum weight. We can find the shortest path between two given vertices by the dijkshtra algorithm.	10
2	Division of the Topic Path and Circuits Shortest path in weighted graph.	30
3.	Conclusion A path in a multi graph G consists of an alternating sequence of vertices and edges of the form v_0, $e_1 \ldots\ldots e_{n-1}.v_{n-1}.e_n$, v_n. The number of edges is called the length of the path. And if the starting and ending points are same like v_0, $e_1 \ldots\ldots e_{n-1}.v_{n-1}.e_n$, $v_{n,}$,v_0.is called as circuit. The shortest path in a weighted graph is the path with minimum weight. We can find the shortest path between two given vertices by the dijkshtra algorithm.	5
4	Question / Answer ▪ Discuss path and circuits. ▪ Explain the various algorithms for shortest path.	5

Assignment to be given:- NIL

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -25

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Euler's path, Euler's Circuit. Euler's Theorem.	**Time Allotted(min):-**
1.	Introduction An Euler's path through a graph is a path whose edge list contains each edge of the graph exactly once. An Euler's circuit through a graph in which the initial vertex appears second time as a terminal vertex. An undirected graph posses a Euler Ian path iff it is connected and has either zero or two vertices of odd degree. Undirected posses an Euler Ian circuit iff it is connected and its vertices are all of even degree.	10
2	Division of the Topic Euler's path Euler's Circuit Euler's Theorem.	30
3.	Conclusion An Euler's path through a graph is a path whose edge list contains each edge of the graph exactly once. An Euler's circuit through a graph in which the initial vertex appears second time as a terminal vertex. An undirected graph posses a Euler Ian path iff it is connected and has either zero or two vertices of odd degree. Undirected posses a Euler Ian circuit iff it is connected and its vertices are all of even degree.	5
4	Question / Answer ▪ Difference between Euler's path and circuit. ▪ State and prove the Euler theorem.	5

Assignment to be given:- NIL

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -26

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Hamiltonian path and circuit and Hamiltonian Theorem.	**Time Allotted(min):-**
1.	Introduction A Hamiltonian graph is a graph which posses a Hamiltonian path. a Hamiltonian path is a path in which visit each vertices exactly once . A Hamiltonian circuit is a circuit that contains each vertex exactly once except for the first vertex which also the last vertex. According to Hamiltonian theorem let G be a linear graph of n vertices .if the sum of degrees for each pair of vertices in G is n-1 or larger than there exist a Hamiltonian path in G.	10
2	Division of the Topic Hamiltonian path and circuit Hamiltonian Theorem.	30
3.	Conclusion A Hamiltonian graph is a graph which posses a Hamiltonian path. a Hamiltonian path is a path in which visit each vertices exactly once . A Hamiltonian circuit is a circuit that contains each vertex exactly once except for the first vertex which also the last vertex.	5
4	Question / Answer ▪ Difference between Hamiltonian path and circuit. ▪ State and prove the Hamiltonian thermo.	5

Assignment to be given:- NIL

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -27

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic :-** Planner graph and Euler's formula for Planner Graph	**Time Allotted(min):-**
1.	Introduction A graph which can be drawn in a plane so that no edges can cross each other than the graph is called as planer graph. Euler's formula for planner graph…. Consider a planner graph G= (V, E) having R numbers of regions, V number of vertices and E number of edges Than V+ R – E =2.	10
2	Division of the Topic Planner graph Euler's formula for Planner Graph	30
3.	Conclusion A graph which can be drawn in a plane so that no edges can cross each other than the graph is called as planer graph. Euler's formula for planner graph…. Consider a planner graph G= (V, E) having R numbers of regions, V number of vertices and E number of edges Than V+ R – E =2.	5
4	Question / Answer ▪ What is planar graph? ▪ State and prove the Euler's formula for planar graph.	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan -28

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Trees, Binary Trees, Spanning Tree.	**Time Allotted(min):-**
1.	Introduction A graph which no cycle is called acyclic graph .a tree an acyclic graph or graph having no cycle. A Binary Tree is an acyclic directed graph if the out degree of every node is less than or equal to 2 in a directed tree then the tree is called a binary tree. A sub graph T of a connected graph G is called a spanning tree of G if T is a tree and T has all the vertices of G.	10
2	Division of the Topic Trees Binary Trees Spanning Tree.	30
3.	Conclusion A graph which no cycle is called acyclic graph .a tree an acyclic graph or graph having no cycle. A Binary Tree is an acyclic directed graph if the out degree of every node is less than or equal to 2 in a directed tree then the tree is called a binary tree. A sub graph T of a connected graph G is called a spanning tree of G if T is a tree and T has all the vertices of G.	5
4	Question / Answer ▪ What is the difference between tree and binary tree? ▪ How will you represent a binary tree?	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -29

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Spanning tree Traversals.	**Time Allotted(min):-**
1.	Introduction A sub graph T of a connected graph G is called a spanning tree of G if T is a tree and T has all the vertices of G. Traversal can be performed by three ways in order traversal, Preorder traversal and post order traversal. Inorder traversal :- Left root Right Preorder traversal: - Root Left Right. Postorder Traversal:-Left Right Root.	10
2	Division of the Topic Spanning tree Traversals.	30
3.	Conclusion Traversal can be performed by three ways in order traversal, Preorder traversal and post order traversal. In inorder traversal we first traverse the left sub tree in Inorder then visit the root of the tree and lastly the right sub tree in inorder. In preorder traversal we first visit the root of the tree then traverse the left sub tree in preorder and lastly traverse the right sub tree in preorder In post order traversal we first traverse the left sub tree in post order and then right sub tree in post order and lastly the root.	5
4	Question / Answer ▪ What is a spanning tree? ▪ Discuss the various methods of drawing minimum spanning tree. ▪ Explain all the three traversal of spanning tree	5

Assignment to be given:- 4th assignment will be given.

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -30

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic :-** Basic Operations: AND, OR NOT	**Time Allotted(min):-**
1.	Introduction Conjunction means ANDing of two statements. Assume p and q is two propositions. Conjunction of p and q to be a proposition which is true when both p and q are true, otherwise false. It is denoted by p ^ q. Disjunction means ORing of two statements. Assume p and q is two propositions. Disjunction of p and q to be a proposition which is true when either one or both p and q are true, and is false when both p and q are false. It is denoted by p V q. Negation means opposite of the original statement. Assume p be proposition, negation of p to be a proposition which is true when p is false and denoted by ~p.	10
2	Division of the Topic Basic Operations: AND, OR NOT	30
3.	Conclusion Conjunction means ANDing of two statements. Assume p and q be two propositions. Conjunction of p and q to be a proposition which is true when both p and q are true, otherwise false. It is denoted by p ^ q. Disjunction means ORing of two statements. Assume p and q is two propositions. Disjunction of p and q to be a proposition which is true when either one or both p and q are true, and is false when both p and q are false. It is denoted by p V q. Negation means opposite of the original statement. Assume p be a proposition , negation of p to be a proposition which is true when p is false and denoted by ~p.	5
4	Question / Answer ▪ Define the following:- Conjunction, Disjunction and Negation	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

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Lecture Plan -31

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Propositions, Tautologies, contradiction.	**Time Allotted(min):-**
1.	Introduction A proposition is a statement which is either true or false. It is declarative Sentence A proposition is a tautology if it is true under all circumstances. It means it contains only True in the column of the truth table. A statement that is always false is called a contradiction. A statement that can be either true or false depending up on the truth values of its variables is called a contingency.	10
2	Division of the Topic Propositions Tautologies Contradiction.	30
3.	Conclusion A proposition is a tautology if it is true under all circumstances. It means it contains only True in the column of the truth table. A statement that is always false is called a contradiction. A statement that can be either true or false depending up on the truth values of its variables is called a contingency.	5
4	Question / Answer ▪ Prove that the statement $(p \rightarrow q) \rightarrow (p \wedge q)$ is a contingency. ▪ Prove that $(p (+) q) \vee (p \downarrow q)$ is equivalent to $p \uparrow q$	5

Assignment to be given:- 5th assignment will be given.

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
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Lecture Plan -32

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic :-** Permutation with and without Repetitions	**Time Allotted(min):-**
1.	Introduction A permutation is an arrangement of a number of objects in some definite order taken some or all at a time. The total number of permutations of n distinct objects taken r at a time is denoted by ${}^{n}P_{r}$ where $1 \leq r \leq n$. The number of permutations of n different objects taken r at a time in which p particular objects do not occur is ${}^{n-p}P_{r}$. With n objects different permutations taking r at a time when every object is allowed to repeat any of time is given by nr.	10
2	Division of the Topic Permutation with and without Repetitions	30
3.	Conclusion A permutation is an arrangement of a number of objects in some definite order taken some or all at a time. The total number of permutations of n distinct objects taken r at a time is denoted by ${}^{n}P_{r}$ where $1 \leq r \leq n$. The number of permutations of n different objects taken r at a time in which particular objects do not occur is ${}^{n-p}P_{r}$. With n objects different permutations taking r at a time when every object is allowed to repeat any of time is given by nr.	5
4	Question / Answer ▪ There are 4 blue, 3 red, 2 black pens in a box. These are drawn one by one. Determine all the permutations. ▪ How many four digit numbers can be formed using the digits 2,4,6,8 with repetition of digit is allowed?	5

Assignment to be given:- NIL
Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series

Doc. No.: DCE/0/15
Revision :00

Lecture Plan -33

Faculty:-Mrs. Pinki **Semester:-III** **Class:- III ECS**
Course Code:-CSE-203-F

Subject:-Discrete Structure **Section- D**

S. No.	**Topic: -** Combinations.	**Time Allotted(min):-**
1.	Introduction A combination is a selection of some or all objects from a set of given objects .where order of the objects does not matter the number of combinations of n objects taken r at a time is represented by n C r. or C(n ,r) $^nC_r = \frac{N!}{r!(n-r)!} \quad 1 \le r \le n$	10
2	Division of the Topic Combinations.	30
3.	Conclusion A combination is a selection of some or all objects from a set of given objects .where order of the objects does not matter the number of combinations of n objects taken r at a time is represented by n C r. or C(n,r) $^nC_r = \frac{N!}{r!(n-r)!} \quad 1 \le r \le n$	5
4	Question / Answer ▪ In how many ways can these letters a, b, c, d, e, f be arranged in a circle? ▪ How many 16-bit strings are there containing exactly 5 zeros?	5

Assignment to be given:- 6^{th} assignment will be given.

Reference Readings:-

- Discrete Mathematics and Structure ……………by Satender Bal Gupta
- Discrete mathematics ……………………………by C.L. Liu
- Discrete Mathematics and Structure ……………Schaum Series