

Math - Anil - 44

SESSION 2023-24

AQAR CRITERION-

CGCOGN15565

GOVERNMENT CHANDULAL CHANDRAKAR ARTS AND SCIENCE COLLEGE PATAN, DURG (C.G.)

**REPORT OF THE PROGRAM**

2023-24 M. sc. - II sem.

S.N.	PROGRAM POINTS	PROGRAM DETAILS
1	Name of the Program:	Green - Board Presentation
2	Date of the Program:	15/04/2024
3	Name of the Department / Cell / Committee (Organized by):	Dept. of Mathematics.
4	Name of the Organizer:	Rajeev Chandraker.
5	Coordinator/Convener Name:	Dr. R.K. Verma.
6	Number of Participants (Attach the list below):	06
7	Total No. of Beneficiaries (Attach the list below):	06
8	Chief Guest of the Program	
9	President of the Program	
10	Program Conducted By:	Dept. of Mathematics.
11	PRESS Report, if published (Online link, Offline-Press Report)	
12	Brief Report of the Program:  PHOTO/MONO OF THE PROGRAM	Black Board Presentation is used in study & teaching & learning through which group discussion can take place. Black Board presentation is a way in which students not only become familiar with teaching but other students also benefit from the topic presented by the students.

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math - April - 45

SESSION 2023-24

AQAR CRITERION-

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**REPORT OF THE PROGRAM**

2023-24

M.sc. - IV sem

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1	Name of the Program:	Green Board Presentation
2	Date of the Program:	15/04/2024
3	Name of the Department / Cell / Committee (Organized by):	Dept. of mathematics.
4	Name of the Organizer:	Jayendra shrivastava,
5	Coordinator/Convener Name:	Dr. R.K. Verma,
6	Number of Participants (Attach the list below):	03
7	Total No. of Beneficiaries (Attach the list below):	03
8	Chief Guest of the Program	
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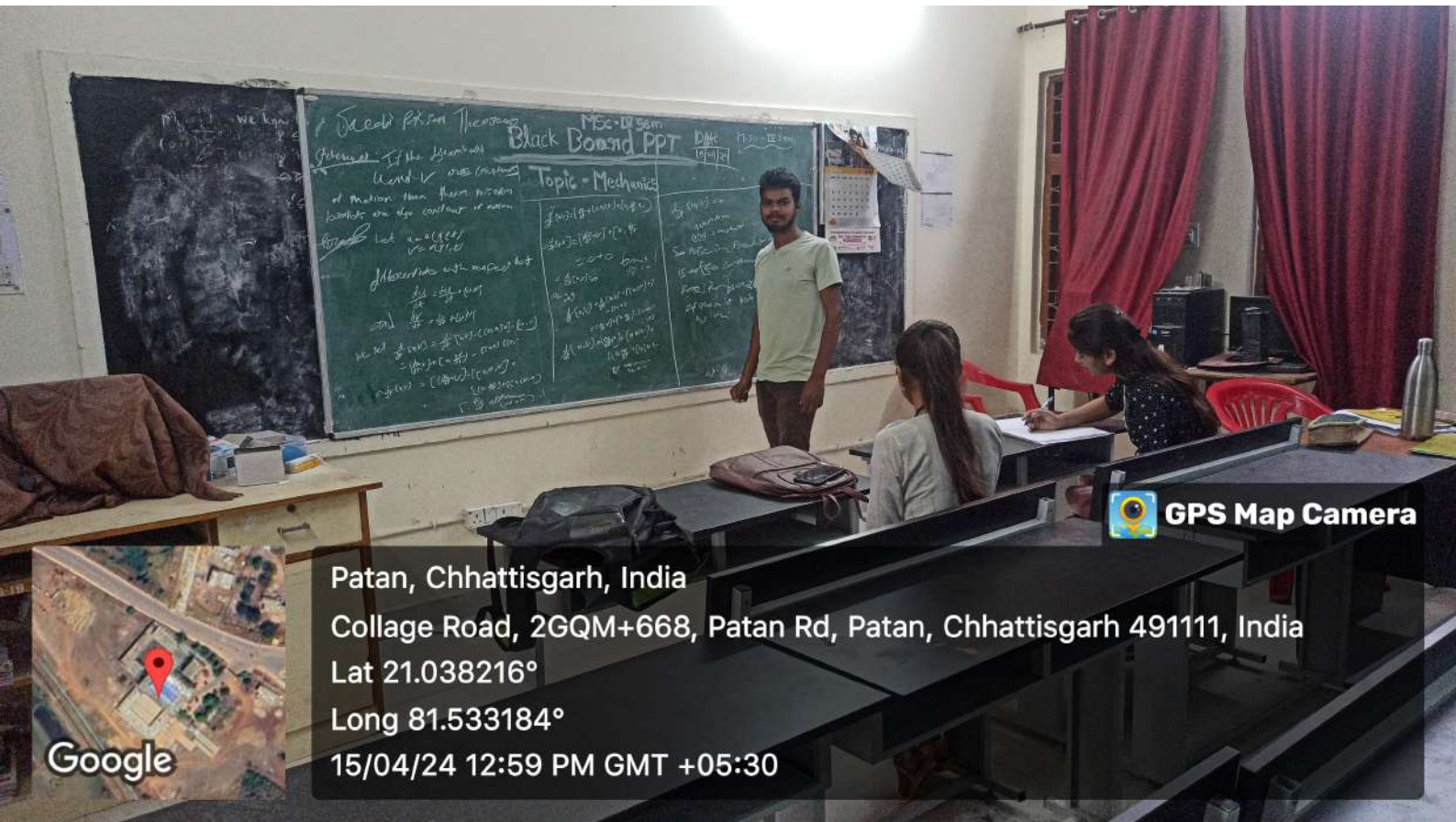
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M.Sc - IV Sem  
**Black Board PPT** DATE 15/04/24 M.Sc - IV Sem  
 Topic - Graph Theory

**Ramsey's Theorem**

Statement :- If  $r$  and  $k$  are positive integers  
 $X$  is an infinite set and  $C$  is a  $k$ -colouring of  $X$  then  $C$  contains an infinite monochromatic subset.

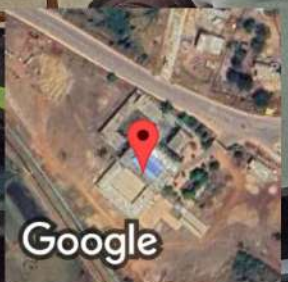
Proof - Regular set :-  
 (1)  $X_{100} := \text{Rule} = \text{set of all } n \text{ subset of set } X$

Ex :-  $X = \{1, 2, 3\}$   
 $X_{100} = \{1, 2, 3, \dots\}$

(2)  $k$ -colouring :-  $k$  is a function from set  $X$  to colour set  $C$  such that  $C$  is an  $k$ -element set.

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## Project Topic

- F.A - The generalize Lax - Milgram theorem.
- Mechanics - Hamilton Jacobi eq<sup>n</sup> Jacobi Theorem  
method of separation of variables.
- Fuzzy - Individual decision making multiperson decision making  
Multicriteria decision making.
- O.R. - Queuing System Deterministic Queuing system
- Graph Theory - Topics in Algebraic Graph theory

## PPT Topic

Jacobi Poission Theorem (Mechanics)

Roll No.

Digeshwar KumarPPT TOPICGraph theory - Ramsey theorem and its properties.Project topic1. F.A. - The generalized Cauchy-Milgram theorem2. Mechanics :- Equi-potential and solid harmonics, surface density and harmonics3. Fuzzy sets :- Linguistic Hedges, Inference from conditions fuzzy propositions4. O.R. :- Solution by linear programming5. Graph theory :- Co-chromatic (co-dichromatic) graph

Name - Rupesh Dewangan

Date \_\_\_\_\_  
Page \_\_\_\_\_

**PPT:- Topic** - Graph theory  
[ Polynomial and Graph Enumeration ]

Project :-

F.A. - Uniform boundedness theorem and some of its Co - sequence

Mechanics - Work done by self attracting system distributions for a given polynomial

Fuzzy - Fuzzy linear programming with example

OR - PURE strategy saddle point and  $2 \times 2$  games without saddle point

Graph theory - Degree Sequence



# MOHNISH

1.) F.A. - Adjoint of an operator on a Hilbert Space. [U-4]

2.) Mechanics - Euler's eqn for one dependent function under integral constraints. [U-2]

3.) Fuzzy - Fuzzy Neural Network & fuzzy automata with examples. [U-3]

4.) O.R. - Dominance Rules [U-2]

5.) Graph - Symmetry Concept, pseudo similarity and stability. [U-2]

PPT Topic ⇒

Whittaker's Equations

DECEMBER							2014
Wk.	M	T	W	T	F	S	S
49	1	2	3	4	5	6	7
50	8	9	10	11	12	13	14
51	15	16	17	18	19	20	21
52	22	23	24	25	26	27	28
53	29	30	31				



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SESSION 2023-24

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2023-24

M.sc. II Sem.

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1	Name of the Program:	Green Board Presentation
2	Date of the Program:	16/04/2024
3	Name of the Department / Cell / Committee (Organized by):	Deptt. of mathematics
4	Name of the Organizer:	Priya Chandraker,
5	Coordinator/Convener Name:	Dr. R. K. Verma,
6	Number of Participants (Attach the list below):	03
7	Total No. of Beneficiaries (Attach the list below):	03
8	Chief Guest of the Program	
9	President of the Program	
10	Program Conducted By:	Deptt. of mathematics.
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12	Brief Report of the Program: <div data-bbox="300 1198 721 1915" style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px 0;">PHOTO/MONO OF THE PROGRAM</div>	Black Board presentation is used in study & teaching & learning through which group discussion can take place. Black Board presentation is a way in which students not only become familiar with teaching but other students also benefit from the topic presented by the students.

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M.Sc. II Sem (Block - Board Presentation) - Topic - Legendre Duplication  
 Date - 16/04/24

Theorem: Legendre's duplication formula  
 $\Gamma(z)\Gamma(z+\frac{1}{2}) = 2^{1-2z} \sqrt{\pi} \Gamma(2z)$

Condition: We know that  
 Euler's Gamma function  
 $\Gamma(z) = \int_0^{\infty} t^{z-1} e^{-t} dt$

Differentiating about  $z$   
 $\frac{1}{\Gamma(z)} = -\psi(z) = -\frac{\Gamma'(z)}{\Gamma(z)}$

Legendre's duplication formula  
 $\Gamma(z)\Gamma(z+\frac{1}{2}) = 2^{1-2z} \sqrt{\pi} \Gamma(2z)$

Again differentiating  
 $\frac{d}{dz} \Gamma(z)\Gamma(z+\frac{1}{2}) = \frac{d}{dz} [2^{1-2z} \sqrt{\pi} \Gamma(2z)]$

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M.Sc. II Sem (Block - Special Presentation) - P-II (Real Analysis)  
Date: 16/04/24

Topic: Completeness of  $L^p$

Theorem: An  $L^p$ -space is a normed linear space

Proof:  $f, g \in L^p$  we have that  $L^p(\mu)$  is a linear space

show that  $\|f+g\|_p \leq \|f\|_p + \|g\|_p$  and  $\|cf\|_p = |c| \|f\|_p$

we see that

$f, g \in L^p(\mu) \Rightarrow \int_X |f|^p d\mu < \infty$  and  $\int_X |g|^p d\mu < \infty$  ①

Define  $A = \{x \in X : |f(x)| > |g(x)|\}$  and  $B = X - A$

Then  $\int_X |f+g|^p d\mu = \int_{A \cup B} |f+g|^p d\mu$

$= \int_A |f+g|^p d\mu + \int_B |f+g|^p d\mu$

$\leq \int_A (|f|+|g|)^p d\mu + \int_B (|f|+|g|)^p d\mu$

$\leq \int_A (|f|^p + |g|^p) d\mu + \int_B (|f|^p + |g|^p) d\mu$

$\leq \int_X |f|^p d\mu + \int_X |g|^p d\mu < \infty$  {from eq<sup>n</sup> ①}

② We see that any  $a \in \mathbb{R}$ ,  $f \in L^p(\mu)$

$\int_X |af|^p d\mu = |a|^p \int_X |f|^p d\mu < \infty$

Thus  $a \in \mathbb{R}, f \in L^p(\mu) \Rightarrow af \in L^p(\mu)$

They we have to show that

$\Rightarrow f(x) = \sum_{k=1}^{\infty} \dots$

(where  $z \in \mathbb{C}$ )

B.Sc. I - 1.2

M.Sc. I - 1.2

B.Sc. II - 1.2

B.Sc. III - 1.2

4

III - 2

... (ii) + (vii) we get

$\Rightarrow \dots = \int \frac{f(x)}{x-t_0} dx$



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M.Sc. - II Sem  
Date - 16/04/24

# (Black-Board Presentation) - P-II (Real Analysis)

Problem :- Find the analytic continuation of the function  $f_1$  defined by the series  $f_1(z) = \sum_{n=0}^{\infty} z^n$

Proof :- Given that

$$f_1(z) = 1 + z + z^2 + \dots + z^n + \dots$$

$$\Rightarrow f_1(z) = (1-z)^{-1} \text{ when } |z| < 1$$

$$\Rightarrow f_1(z) = \frac{1}{1-z} \text{ when } |z-0| < 1$$

Thus  $f_1(z)$  is analytic in the domain  $|z-0| < 1$   
Assume that  $0 < b < 1$

and let

$$f_2(z) = \frac{1}{1-b} + \frac{z-b}{(1-b)^2} + \frac{(z-b)^2}{(1-b)^3} + \dots$$

$$\Rightarrow f_2(z) = \frac{1}{1-b} \left\{ 1 + \frac{z-b}{1-b} + \frac{(z-b)^2}{(1-b)^2} + \dots \right\}$$

$$\Rightarrow f_2(z) = \frac{1}{1-b} \left[ 1 - \frac{z-b}{1-b} \right]^{-1}, \text{ where } \left| \frac{z-b}{1-b} \right| < 1$$

$$\Rightarrow f_2(z) = \frac{1}{1-b} \left[ \frac{1-b-z+b}{1-b} \right]^{-1}$$

where  $|z-b| < |1-b|$

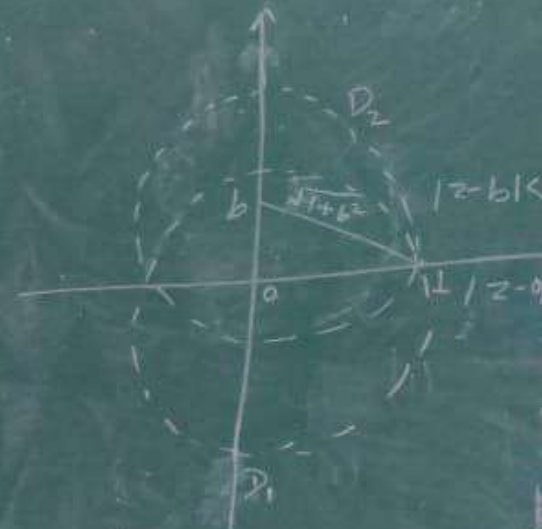
$$\Rightarrow f_2(z) = \frac{1}{1-b} \left( \frac{1-z}{1-b} \right)^{-1}$$

$$\Rightarrow f_2(z) = \frac{1}{1-b} \times \frac{1-b}{1-z}$$

where  $|z-b| < |1-b|$

$$\Rightarrow f_2(z) = \frac{1}{1-z}, \text{ where } |z-b| < |1-b|$$

Thus  $f_2(z)$  is analytic domain  $|z-b| < |1-b|$



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SESSION 2023-24

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**REPORT OF THE PROGRAM**

2023-24

Misc. - IV sem,

S.N.	PROGRAM POINTS	PROGRAM DETAILS
1	Name of the Program:	Green Board Presentation,
2	Date of the Program:	16/04/2024
3	Name of the Department / Cell / Committee (Organized by):	Deptt. of mathematics.
4	Name of the Organizer:	Profya chandraker,
5	Coordinator/Convener Name:	Dr. R.K. verma,
6	Number of Participants (Attach the list below):	03
7	Total No. of Beneficiaries (Attach the list below):	03
8	Chief Guest of the Program	
9	President of the Program	
10	Program Conducted By:	Deptt. of mathematics.
11	PRESS Report, if published (Online link, Offline-Press Report)	
12	Brief Report of the Program: <div data-bbox="319 1153 742 1870" style="border: 1px solid black; padding: 5px; margin: 5px 0;">PHOTO/MONO OF THE PROGRAM</div>	Black Board presentation is used in study & teaching & learning through which group discussion can take place. Black Board presentation is a way in which students not only become familiar with teaching but other students also benefit from the topic presented by the students.

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Math - Nov. 13

SESSION 2023-24

AQAR CRITERION-

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GOVERNMENT CHANDULAL CHANDRAKAR ARTS AND SCIENCE COLLEGE PATAN, DURG (C.G.)

**REPORT OF THE PROGRAM**

2023-24

M.Sc. I Sem

S.N.	PROGRAM POINTS	PROGRAM DETAILS
1	Name of the Program:	Black board presentation (Group Learning)
2	Date of the Program:	04/11/2023
3	Name of the Department / Cell / Committee (Organized by):	Deptt. of Mathematics
4	Name of the Organizer:	Pooja Chandrakar
5	Coordinator/Convener Name:	Dr. R.K. Verma
6	Number of Participants (Attach the list below):	08
7	Total No. of Beneficiaries (Attach the list below):	08
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Maths - Nov. - 13p

SESSION 2023-24

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GOVERNMENT CHANDULAL CHANDRAKAR ARTS AND SCIENCE COLLEGE PATAN, DURG (C.G.)

**REPORT OF THE PROGRAM**

2023-24

M.Sc. III Sem.

S.N.	PROGRAM POINTS	PROGRAM DETAILS
1	Name of the Program:	Black board presentation (group learning)
2	Date of the Program:	04/11/2023
3	Name of the Department / Cell / Committee (Organized by):	Deptt. of Maths.
4	Name of the Organizer:	Jayendra Shrivastava
5	Coordinator/Convener Name:	Dr. R.K. Verma
6	Number of Participants (Attach the list below):	11
7	Total No. of Beneficiaries (Attach the list below):	11
8	Chief Guest of the Program	
9	President of the Program	
10	Program Conducted By:	Deptt. of Mathematics
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Math - Nov-15

SESSION 2023-24

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**REPORT OF THE PROGRAM**

2023-24

M.Sc. - III Sem

S.N.	PROGRAM POINTS	PROGRAM DETAILS
1	Name of the Program:	Black board presentation (Group Learning)
2	Date of the Program:	06/11/2023
3	Name of the Department / Cell / Committee (Organized by):	Dept. of Mathematics.
4	Name of the Organizer:	Jayendra Shrivastava
5	Coordinator/Convener Name:	Dr. R.K. Verma.
6	Number of Participants (Attach the list below):	12
7	Total No. of Beneficiaries (Attach the list below):	12
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Math - Nov - 16

SESSION 2023-24

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Misc. I Sem.

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2	Date of the Program:	06/11/2023
3	Name of the Department / Cell / Committee (Organized by):	Deptt. of Mathematics.
4	Name of the Organizer:	Priya chandrakar,
5	Coordinator/Convener Name:	Dr. R.K. Verma
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Sl. No.	Name of Student	Paper I (AAA) 04-11-23	P-II (Real) 06-11-23	P-III (Topo.) 07-11-23	P-IV (Complex) 08-11-23	P-V (Discrete) 09-11-23
1.	Posiyanka Vejma <u>Pragya</u> 9644281182	Topic → Extension of field	Topic → The Weierstrass Theorem and Stone-Weierstrass Theorem (Approximation)	Topic → Zorn's Lemma	Topic - Maximum Modulus Principle	Topic - Homomorphism of Boolean Algebras
2.	Jagriti Shahu <u>Disha</u> 7838782104	Separable and inseparable extensions	Power Series	Topic - Interior, Exterior, Frontier	Taylor's Theorem	Quotient Semigroup
3.	Pallavi Vejma <u>Sumit</u> 9360088303	Normal and Subnormal Series	Dirichlet's Theorem	Kuratowski's Theorem	Cauchy's Goursat Theorem	Quantifiers
4.	Vidya Nishad	Composition Series	Simple properties of Riemann-Stieltjes	Countable and Uncountable Sets	Cauchy's Residue Theorem	Logic Statement
5.	Madhuri	Jordan-Holder Theorem	Tauber's Theorems	Topological space and related theorems	Schwarz's Lemma	Congruence relation

No.	Name	04-11-2023 Paper-I (AAA) 4-11-23	06-11-2023 Paper-II (Real) 6-11-23	07-11-2023 Paper-III (Topo) 7-11-23	08-11-2023 Paper-IV (Complex) 8-11-23	09-11-2023 Paper-V (Discrete) 9-11-23
6.	Bhargava	Solvable group and nilpotent group.	Inverse function	Neighbourhood	Roches Theorem	Semigroup and Monoid definition
7.	Nandini	Galois Theory	Green's Theorem	Bases, Subbase,	Morse's Theorem	Language and Grammar
8.	Umakant 6267651592 Ushin.	Normal Extension	Linear Transformation.	Subspaces and Relative Topology	Lauren't Series	Basic Homomorphism Theorem
9.	Ankit 7987730266 Ankit	Finitely Generated	Continuity of Same function.	Cantor's Theorem	Cauchy Integrals	Sub semigroup and sub monoid definition.

Program Name :- Topic of Group Discussion (M.Sc.T Mathematics 2023-24)

S.	Name	Paper I (AAA) 04-11-23	P-II (Real) - 06-11-23	P-III (Topo) - 07-11-23	P-IV (Complex) 8-11-23	P-V (Discrete) 09-11-23
11.	Khilaswari Tandon	Field Theory	Jacobians	Axiom of choice	Poisson's Theorem	Tautology
12.	Rajeswari	Polynomials related Question	Find the Value of Maximum and Minimum	Cardinal Number and closed set, Open set.	Cross-Ratios	De-morgan's Law

Date-4-11-23 Green-Board - Representations, M.Sc. I<sup>st</sup> (Sem) - (Maths)

Topic → Extension of field

By - Priyanka Verma

Defn :- If  $F$  is a field  $E$ , then  $E$  is an extensions field of  $F$ .

Proof :- Suppose that  $[E:F] = m$  and that  $[E:F] = n$ . Let  $(v_1, v_2, \dots, v_n)$  be a basis of  $k$  over  $E$ , and let  $(w_1, w_2, \dots, w_m)$  be a basis of  $E$  over  $F$ . Let  $u$  be any element of  $k$ . Since every element in  $k$  is a linear combination of  $v_1, v_2, \dots, v_n$  with coefficient in  $E$ , we have

$$u = \sum_{i=1}^n a_i v_i, a_i \in E$$

Because each  $a_i \in E$  and every element  $E$  is linear combination of  $w_1, w_2, \dots, w_m$  with coefficient in  $F$ , we have

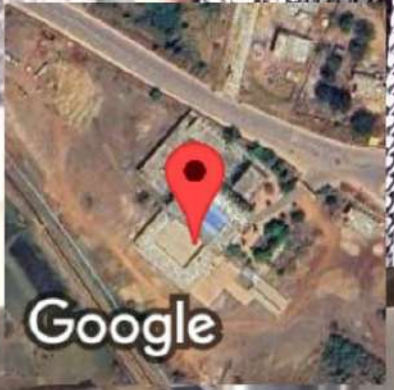
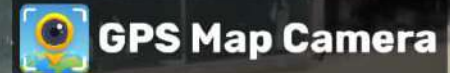
$$a_1 = b_{11}w_1 + b_{12}w_2 + \dots + b_{1m}w_m$$

$$a_2 = b_{21}w_1 + b_{22}w_2 + \dots + b_{2m}w_m$$

$$a_m = b_{m1}w_1 + b_{m2}w_2 + \dots$$



$k$  be field. If  $k$  extension of  $E$  and  $n$  of  $F$ . then  $k$  is and  $[k:F] = [k:E][E:F]$



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Date-4-11-23 Green-Board - Representations, T<sup>st</sup> (Sem) - (M)

Topic → Normal Series

By-Pallavi Verma

Definition - If  $\{e\} = G_0 \triangleleft G_1 \triangleleft \dots \triangleleft G_{n-1} \triangleleft G_n = G$

$$G = H_0 \triangleleft H_1 \triangleleft H_2 \dots \triangleleft H_n = \{e\}$$

Then this series is called normal series

The factors of a normal series are the quotient group

$$G = H_0 \supset H_1 \supset H_2 \dots \supset H_n = \{e\}$$

is said to be a subnormal series

$$\frac{H_i}{H_{i-1}} \quad 1 \leq i \leq n$$

if  $H_{i-1}$  is a normal subgroup of  $H_i$

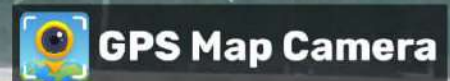
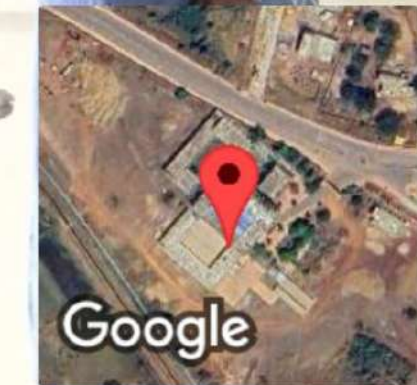
then the series is called normal

Example -  $\{e\} \triangleleft N = \{e, (1,2), (1,3), (2,3)\} \triangleleft S_3$

series of a group an written as

It is normal series for

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सिपकोटा के  
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तरी  
गति  
गहमा  
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Date-4-11-23 Green-Board - Representations, 7<sup>th</sup>-T<sup>st</sup>(Sem)-(Maths)

Topic → Composition Series By- Vidya Nishad

Definition - Let  $G$  be a group and  $H_0, H_1, \dots, H_n$  a subgroup of  $G$  then normal of  $G$ .

$$\{e\} = H_0 \subset H_1 \subset H_2 \subset \dots \subset H_n = G$$

is said to be a composition series

the factor group  $\frac{H_i}{H_{i-1}}$  is simple

Every finite group has a composition

Proof - Suppose  $G$  is a finite group we have to prove that  $G$  has a composition series.

Since  $G$  is finite group therefore two conditions are.

(1)  $G$  is simple.

(2)  $G$  is not simple.

Case I -  $G$  is simple - Then  $G$  is subset of  $\{e, G\}$   $G$  has a composition series

$G$  has a composition series with

Factor



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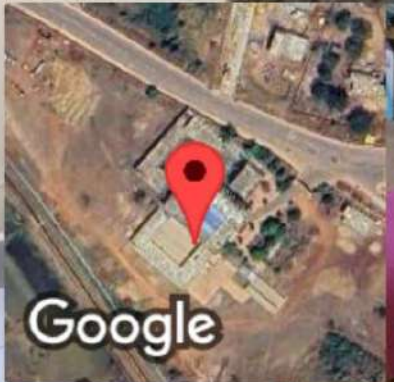
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$A \subseteq B \subseteq C \subseteq 10^4$   
 विद्या  
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 ज्ञान  
 कुम्भक  
 प्रकाश  
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 सुपार  
 प्रार  
 मोदी  
 गोपी  
 महारा  
 ज्ञानी  
 केरमा  
 अज्ञान  
 मोही  
 खट्टी  
 आसदी  
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 अहम  
 गोप्य  
 कोरमा  
 पंदर  
 सुप्रशरि  
 योग  
 नाद  
 कुम्भक  
 कश्यप  
 इनी मुंड्य

Date-4-11-23 Green-Board - Representations, M-T (Sem)-Maths  
 Topic - Separable and inseparable extensions  
 By- Jagruti Sahu  
 Def<sup>n</sup> :- An algebraic extension E of a field F is called a separable extension if each element of E is separable over F otherwise E is called an inseparable extension.  
 Prop<sup>n</sup> :- Every finite separable extension of a field is necessarily simple extension.  
 Ex<sup>m</sup> :- Let F be a finite field and E be a finite extension of F.  
 Thus, each finite extension E of a finite field F is simple. So, we now suppose that F is infinite. Because E is a finite extension of F,  $E = F(a_1, a_2, \dots, a_n)$  where,  $a_i \in E, 1 \leq i \leq n$  are algebraic over F. We find show that  $E = F(\alpha)$  then  $\exists$  an element  $\alpha \in E$  such that,  
 $F(\alpha, \beta) = F(\beta)$   
 Then the result will follow by induction; that is,  $\exists c \in E$  such that  $E = F(a_1, a_2, \dots, a_n) = F(c)$   
 Let  $p(x)$  and  $q(x)$  be the minimal polynomials for  $\alpha$  and  $\beta$  over F with degrees n and m, respectively. Let the roots of  $p(x)$  be  $\alpha = \alpha_1, \alpha_2, \dots, \alpha_n$  and let those of  $q(x)$  be  $\beta = \beta_1, \beta_2, \dots, \beta_m$  in  $\bar{F}$ .  
 Let the roots of  $p(x)$  be  $\alpha = \alpha_1, \alpha_2, \dots, \alpha_n$  and let those of  $q(x)$  be  $\beta = \beta_1, \beta_2, \dots, \beta_m$  in  $\bar{F}$ .  
 Let the roots of  $p(x)$  be  $\alpha = \alpha_1, \alpha_2, \dots, \alpha_n$  and let those of  $q(x)$  be  $\beta = \beta_1, \beta_2, \dots, \beta_m$  in  $\bar{F}$ .  
 $\alpha + \beta = \alpha + \beta, \alpha_i \neq \beta_j$

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Date-4-11-23 Green-Board - Presentations, 1<sup>st</sup> Sem (Maths)

Topic - Galois theory

By - Nandini Sahu

Theorem - (Fundamental theorem of Galois theory)

Let  $E$  be a Galois extension of  $F$  a field of characteristic  $\neq 2$ . Let  $K$  be a subfield of  $E$  containing  $F$ . Let  $\sigma \in \text{Gal}(E/F)$ . Then  $\sigma(K) = K$  if and only if  $\sigma$  is in the Galois group of  $E/K$ .

(iv)  $K$  is normal extension of  $F$  if and only if  $\text{Gal}(E/K)$  is normal subgroup of  $\text{Gal}(E/F)$ .

(v) If  $K$  is normal extension of  $F$ , then  $\text{Gal}(F/K) = \text{Gal}(E/F) / \text{Gal}(E/K)$ .

Proof - (i) since  $E$  is Galois extension of  $F$ , it is normal extension of  $F$ , and therefore  $E$  is splitting field of  $f(x)$  over  $K$ . Again since  $K$  is subfield of  $E$  containing  $F$ ,  $E$  is splitting field of  $f(x)$  over  $K$ .

(ii) Because  $E$  is normal extension of  $F$  and we have given that  $H$  is a subgroup of  $\text{Gal}(E/F)$ .

(iii) Because  $E$  is normal extension of  $F$  and also of  $K$  we have  $[E:F] = |\text{Gal}(E/F)|$  and  $[E:K] = |\text{Gal}(E/K)|$ .

Thus the transitivity of Galois extension  $[E:F] = [E:K][K:F]$

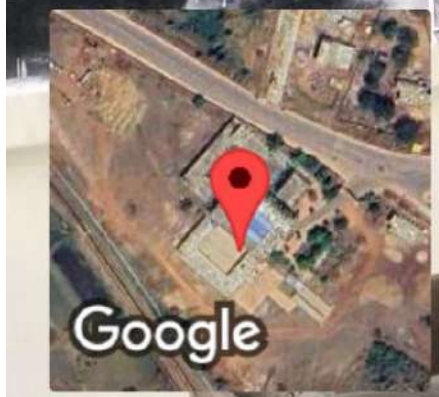
Thus  $|\text{Gal}(E/F)| = |\text{Gal}(E/K)| \cdot |\text{Gal}(K/F)|$

Hence,  $[K:F] = \text{index of } \text{Gal}(E/K) \text{ in } \text{Gal}(E/F)$ .

(v) Let  $K$  be a normal extension of  $F$ . Then by the preceding discussion  $\sigma(K) = K$ .

Thus - induces an automorphism  $\sigma^*(\sigma) = \sigma(E), K \subseteq E$

$f(x) = \frac{x^2 - 2}{x^2 - 3}$   
 Galois 26 k...  
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Date-4-11-23 Green-Board - Presentations, M.T.S.T (Sem) - Math

Topic - Solvable Group

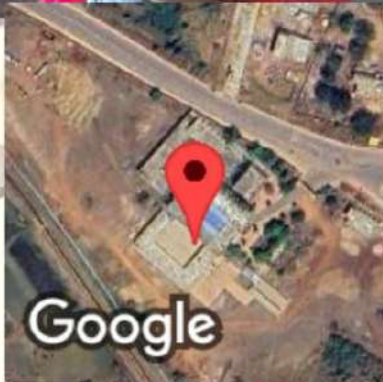
By Bhureshwari

Theorem - A group  $G$  is Solvable iff  $G^k = \{e\}$  for some positive integer  $k$ .  
 $G = G^0 \supset G^1 \supset G^2 \supset \dots \supset G^k = \{e\}$   
 This means group  $G$  said to be solvable if  $G^k = \{e\}$  for some positive integer  $k$ .

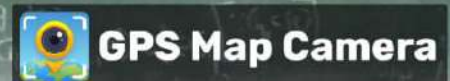
Main Proof  $\Rightarrow$  first suppose  $G_i$  is Solvable Group then  $G_i$  has a composition series  $\{e\} = G_{i0} \subset G_{i1} \subset G_{i2} \subset \dots \subset G_{in} \subset G_i$  such that it factors  $\frac{G_i}{G_{i-1}}$  is abelian  $\{i=1, 2, 3, \dots, k\}$  we have  $G_i = \{G_{i-1}, x : x \in G_i\}$   
 Let  $G_{i-1} x \in \frac{G_i}{G_{i-1}}$  and  $G_{i-1} y \in \frac{G_i}{G_{i-1}}$  where  $x, y \in G_i$   
 $\therefore \frac{G_i}{G_{i-1}}$  is abelian it follows that the

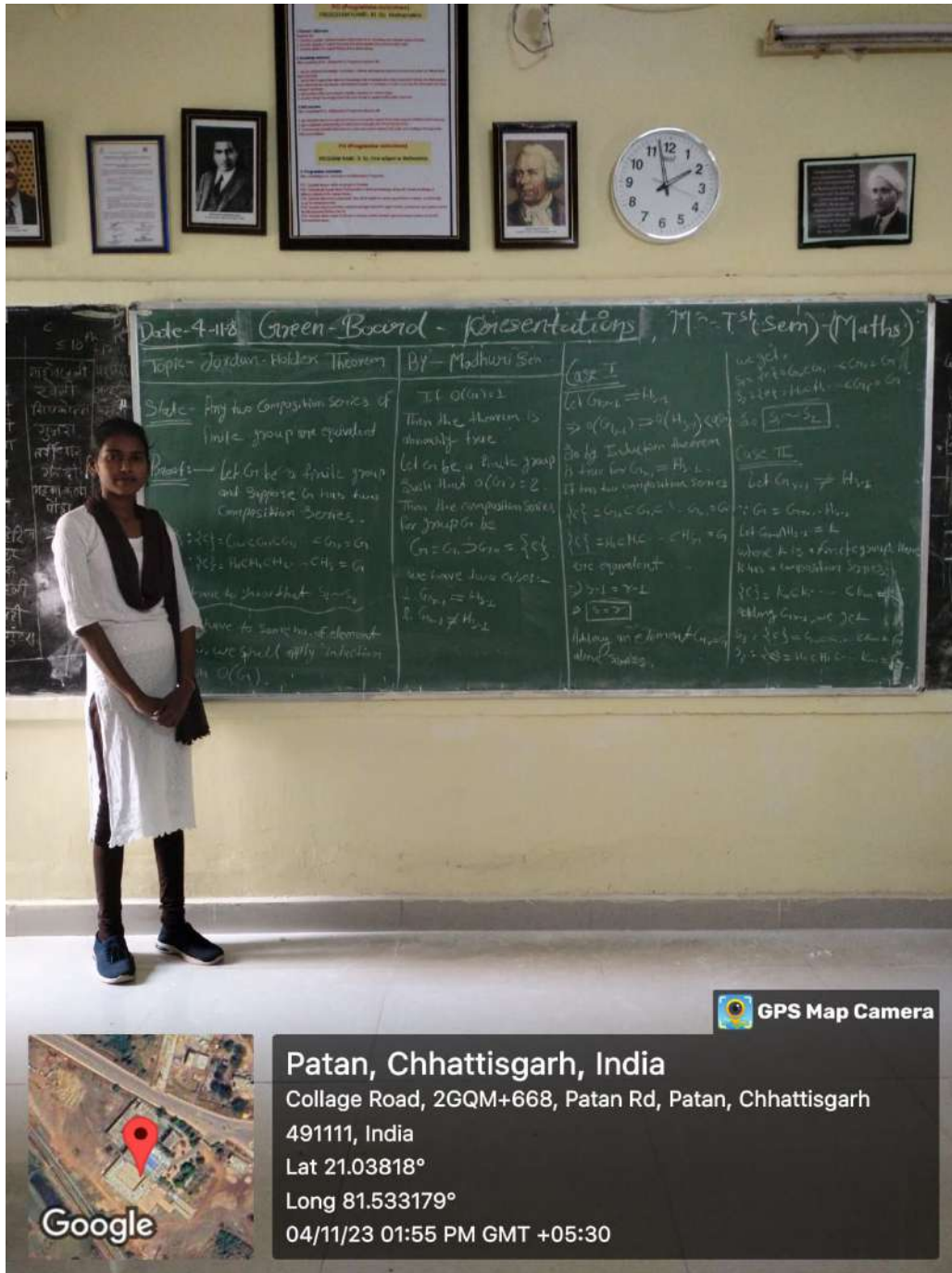
Commutative law holds in  $G_i$ . Thus  $(G_{i-1} x)(G_{i-1} y) = (G_{i-1} y)(G_{i-1} x)$   
 $G_{i-1} xy = G_{i-1} yx$   
 $xy(G_{i-1}) \in G_{i-1}$   
 $xy = yx$   
 but  $x, y \in G_i \Rightarrow xy = yx \in G_i$   
 This  $G_i \subseteq G_{i-1}$   
 Taking  $i=1$   
 $G_1 \subseteq G_0$   
 $G_1 \subseteq \{e\}$   
 Taking

Similarly, we show that  $G_k = \{e\}$  for some positive integer  $k$ .  
 Conversely -  $G = \{e\}$  for some positive integer  $k$ . To prove that Solvable we that



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Date-4-11-23 Green-Board - Presentations, M.T-1st(Sem)-(Maths)

Topic- Jordan-Hölder Theorem

By- Madhuri Sen

State- Any two Composition Series of finite group are equivalent

Proofs- Let  $G$  be a finite group and suppose  $G$  has two Composition Series...

$\{G_1, G_2, \dots, G_n\}$   
 $\{H_1, H_2, \dots, H_m\}$   
we have two series  
 $G_1 = G, G_2 = H_1, \dots$   
we shall apply induction on  $O(G)$ .

IL  $O(G) = 1$   
Then the theorem is trivially true

Let  $G$  be a finite group such that  $O(G) = 2$   
Then the composition series for group  $G$  be

$G = G_1 > G_2 = \{e\}$   
we have two series  
 $G_1 = G, G_2 = H_1, \dots$   
 $H_1 = G, H_2 = \{e\}$

Case I

Let  $G_{i+1} = H_j$   
 $\Rightarrow O(G_{i+1}) = O(H_j) < O(G_i)$

Do by Induction Assumption is true for  $G_{i+1} = H_j$   
It has two composition series

$\{G_i, G_{i+1}, \dots, G_n\}$   
 $\{H_j, H_{j+1}, \dots, H_m\}$

are equivalent  
 $\Rightarrow G_i = H_j = L$

Adding an element  $G_{i+1} = H_j$  to both series

we get  
 $\{G_i, G_{i+1}, \dots, G_n\}$   
 $\{H_j, H_{j+1}, \dots, H_m\}$   
are equivalent

Case II

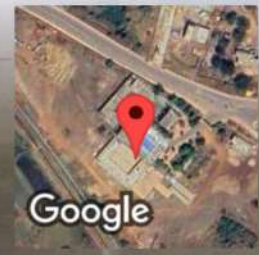
Let  $G_{i+1} \not= H_j$   
 $\therefore G_i = G_{i+1} \cdot H_{j+1}$   
Let  $G_{i+1} = H_j = L$   
where  $L$  is a proper group. Here  $L$  has composition series

$\{L, L_1, \dots, L_k\}$   
Adding  $G_{i+1}$  we get

$\{G_i, G_{i+1}, \dots, G_n\}$   
 $\{L, L_1, \dots, L_k, \dots, H_m\}$

are equivalent  
 $\Rightarrow G_i = H_j = L$

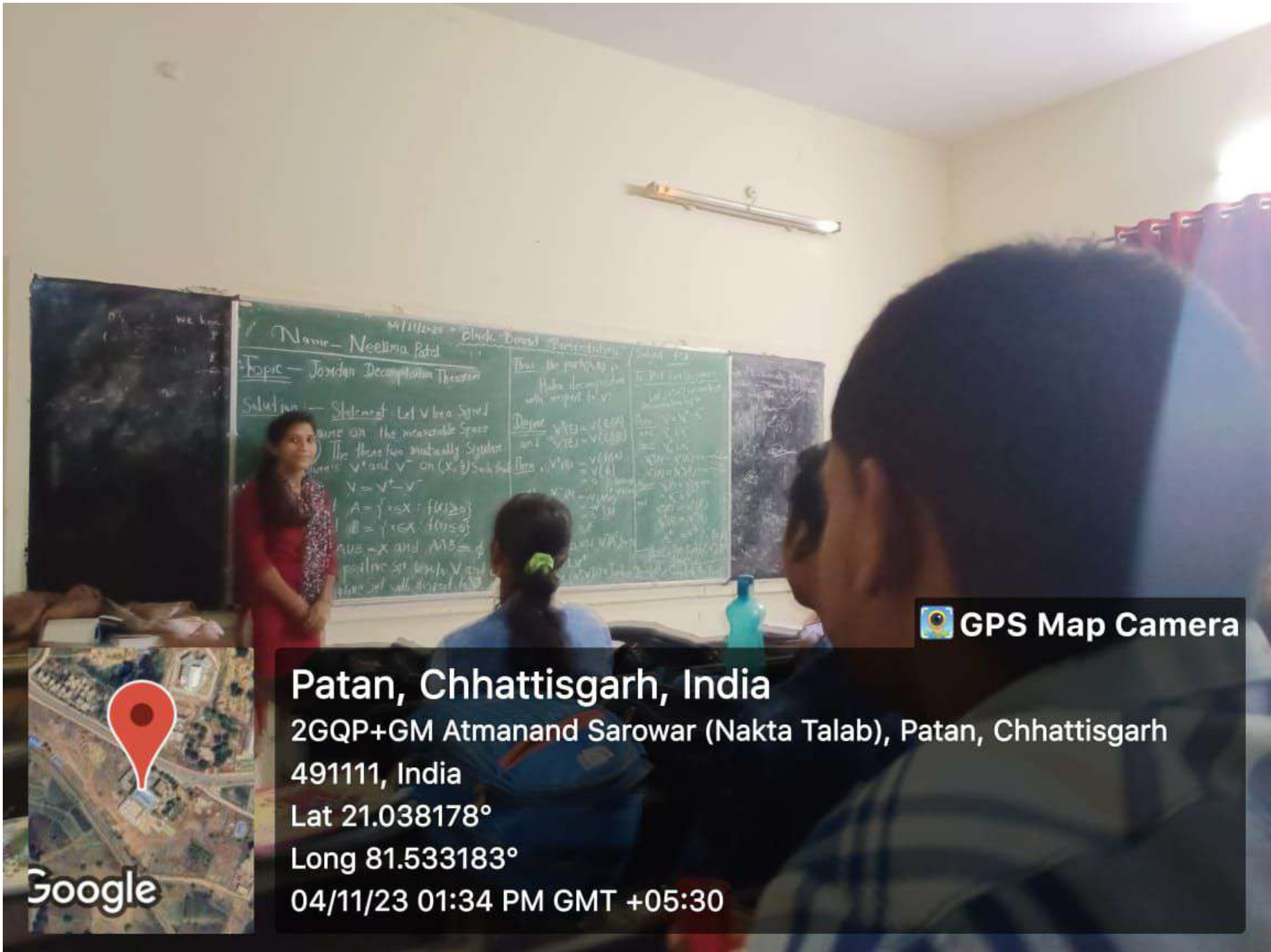
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No.	Name	Fuzzy set	P.D.E.	TOPs	F.A.	O.R.	Graph Theory
1.	Digeshwar Ku.	First Decomposition Theorem	Fundamental solution of Laplace's equ.	Lebegue Decomposition Theorem		simplex method	Every planar graph is K-vertex colourable iff every plane graph is K-face colourable
2.	Anasika jena	$ A+B  =  A \cup B  +  A \cap B $	Non Homogenous problem	Radon Nikodym Theorem		Assignment problem	prove that if a graph H is homomorphic to a graph G. Then G is contraction of H.
3.	Rity Sahu	$\alpha^+ A \cap \alpha^+ B = \alpha^+(A \cap B)$ $\alpha^+ A \cup \alpha^+ B = \alpha^+(A \cup B)$	local Estimate for harmonic function	Riesz - markoff theorem		Graphical method	Permutation graph, split graph, forbidden subgraph.
4.	Ruposh Dewangan	Second Decomposition theorem	Mean value theorem	Carathodory extension theorem		Dual simplex method	P.V. if a graph G is contractible to a graph H and $\Delta(H) \leq 3$ then G has a subgraph hom from H.
5.	Tamesh Sahu	state & prove Hahn Decomposition theorem (FA)	stationary phase for wave equation	possibility theory (Fuzzy set)		Two phase method	Every planar graph is 5-vertex colourable.
6.	Neelima Patel	Jordan (F.A) Decomposition Theorem	Hopf-Lax Formula	T-Norms (fuzzy set) Triangular		Least Cost Method	Prove that any homomorphic is the product of a Connected.
7.	Prashant Kumar Sahu.	$R(x,y) = \begin{cases} 1-x^2y, & \alpha \leq y \\ 0 & \text{otherwise} \end{cases}$ Find the range and inverse of R	Douichlet's Principle.	Riesz Representation theorem.		North west Corner Method	Prove that if a graph is triangulated iff it has a perfect elimination scheme.
8.	Khushi Chandrakar	First characterization theorem	State and prove Poisson's formula for half space	Countable union of positive set is positive		Prove that dual of the dual is primal	Prove that a connected graph G is isomorphic to its edge graph iff it is a cycle

Sl. No.	Name of Student	F.A.	P.D.E.	Fuzzy	A.R.	Graph Theory.
9.	Mohnish	Jordan Decomposition	Routh's equation of motion	$(i) f\left(\bigcup_{i \in I} A_i\right) = \bigcup_{i \in I} f(A_i)$ $(ii) f\left(\bigcap_{i \in I} A_i\right) \subseteq \bigcap_{i \in I} f(A_i)$	The Dijkstra's Shortest path algorithm.	Prove that the complement of every interval graph is a comparability.
10.	Pragati	✓ Fubini's theorem	$k(y_0) = \min_{y \in R} k(y) \text{ then}$ $\lim_{\epsilon \rightarrow \infty} \frac{\int_{-\infty}^{\infty} k(y) \cdot e^{-\frac{ky}{\epsilon}} dy}{\int_{-\infty}^{\infty} e^{-\frac{ky}{\epsilon}} dy} = k(y_0)$	Convex fuzzy set	VAM (Vogel's Approximation Minimum Spanning tree problem).	Every strongly perfect graph is perfect
11.	Nikita Dewangan	Let E be a measurable set such that $0 < v(E) < \infty$ then there is a positive set A contained in E with $v(A) > 0$	St.P. the symmetry of Green's function	$\alpha + [f(A)] = f(\alpha + A)$ $\alpha [f(A)] \supseteq f(\alpha A)$	VAM (Vogel's Approximation Method)	$m' = \frac{1}{2} \sum_{j=1}^n d_j^2 - m$
12.	Pratima Sahu	Riesz Lemma	Donkin's Theorem	$P = \begin{bmatrix} 0.3 & 0.5 & 0.8 \\ 0.0 & 0.7 & 1.0 \\ 0.4 & 0.6 & 0.5 \end{bmatrix}$ $Q = \begin{bmatrix} 0.9 & 0.5 & 0.7 & 0.7 \\ 0.3 & 0.1 & 0.0 & 0.9 \\ 1.0 & 0.0 & 0.5 & 0.5 \end{bmatrix}$	Big-M method	Prove that for any graph G, $d_0 + B_0 = n$
13.	Vaseem Anaiski	Let $\{(A_i \times B_i)\}$ be a countable disjoint collection of measurable rectangle whose union is measurable rectangle A x B. Then show that $\lambda(A \times B) = \sum \lambda(A_i \times B_i)$	Plancherel theorem $\chi_{(0, \infty)}$	characterization theorem of T-Norms	Dijkstra algorithm (Find the shortest path)	operation on graph.



Name - Noelima Patel

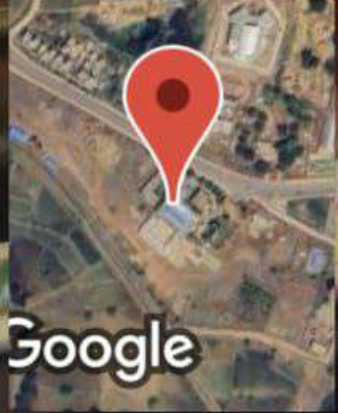
Topic - Jordan Decomposition Theorem

Solution - Statement - Let  $V$  be a finite dimensional  $n \times n$  matrix over  $\mathbb{C}$ . Then there exists a basis for  $V$  such that the matrix is block diagonal with Jordan blocks on the diagonal.

Definition - Let  $V$  be a finite dimensional  $n \times n$  matrix over  $\mathbb{C}$ . Then  $V$  is said to be in Jordan normal form if it is block diagonal with Jordan blocks on the diagonal.

Let  $V = \begin{pmatrix} \lambda & & 0 \\ & \lambda & \\ & & \ddots \end{pmatrix}$  be a Jordan block of size  $k \times k$ . Then  $V^k = \begin{pmatrix} \lambda^k & & 0 \\ & \lambda^k & \\ & & \ddots \end{pmatrix}$ .

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04/11/2023 "Black Board Presentation" Subject - F.T.A.

Name - Pragati Sahu

Sub - Fubini's theorem

Statement - Suppose  $X$  and  $Y$  are  $\sigma$ -finite measure spaces and suppose that  $X \times Y$  is given the product measure (which is unique as  $X$  and  $Y$  are  $\sigma$ -finite)

$\int_{X \times Y} |f(x,y)| d(x \times y) < \infty$ .

then  $\int_X (\int_Y |f(x,y)| d(x \times y)) d(x \times y) = \int_Y (\int_X |f(x,y)| d(x \times y)) d(x \times y)$

$= \int_{X \times Y} |f(x,y)| d(x \times y)$

Proof:- Let  $f$  be a non-negative simple measure function and  $\phi(x) = \int_Y f(x,y) d(x \times y)$  and  $\psi(y) = \int_X f(x,y) d(x \times y)$  and  $\phi$  is  $\sigma$ -integrable and  $\psi$  is  $\sigma$ -integrable

$\int_X \phi(x) d(x \times y) = \int_X (\int_Y f(x,y) d(x \times y)) d(x \times y)$

$= \int_{X \times Y} f(x,y) d(x \times y)$


$= \int_Y (\int_X f(x,y) d(x \times y)) d(x \times y)$

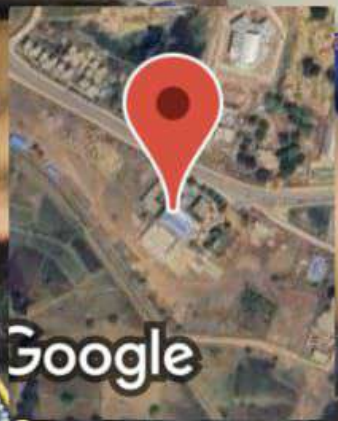
$= \int_Y \psi(y) d(x \times y)$

From  $\sigma$ -integrability  $\int_X \phi(x) d(x \times y) = \int_Y \psi(y) d(x \times y)$

OR

$\int_{X \times Y} f(x,y) d(x \times y) = \int_Y (\int_X f(x,y) d(x \times y)) d(x \times y)$

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we know

Name Khushi 04/11/2023 "Black Board Presentation" / Subject: F.A.

Theorem: Prove that countable union of Negative Set is Negative

Def. Required Definition:  
(i) Negative Set

(ii) Negative set: A set B is said to be negative set w.r.t. a signed measure  $\nu$  if  $\nu E \leq 0$  for any subset of B.

Example: Let  $B = \{1, 2, 3\}$  and a function  $\nu$  defined by  $\nu(x) = x$

(iii) Negative Set:  
(i) Signal Measure  $\nu(2) = 1 - 2 = -1$

Proof: The first statement is directly true by the definition of negative set

To prove that  $\bigcup_{n=1}^{\infty} B_n$  is negative set  
Let  $\{A_n\}$  be a sequence of negative set w.r.t. a signed measure  $\nu$   
By the definition of negative set  $\nu E \leq 0$  for every subset of  $B_n$  of  $A_n$

$$E_n \subseteq A_n$$
$$A = \bigcup_{n=1}^{\infty} A_n$$

then  $E \subseteq A$  and  $\nu(E) = \nu\left(\bigcup_{n=1}^{\infty} E_n\right)$

$$\nu(E) = \sum_{n=1}^{\infty} \nu(E_n)$$


$\Rightarrow \nu(E) \leq 0$   
Thus  $\nu(E) \leq 0$  for each subset  $E \subseteq A$   
This shows that  $A = \bigcup_{n=1}^{\infty} A_n$  is negative set

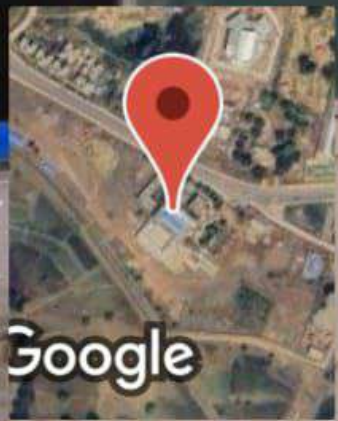
we know  $\nu(E) < \nu(F)$

$$\nu(E) < \nu(F)$$

$$\nu(E) < \nu(F)$$

$$\nu(E) < \nu(F)$$

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Name: Vasem Quraishi

Th'mo - Let  $\{(A_i \times B_i)\}$  be a countable disjoint collection of measurable rectangle whose union is measurable rectangle.  
 $\lambda(A \times B) = \sum \lambda(A_i \times B_i)$

Def'n - Required definition.  
 → Product measure.  
 → Measurable rectangle

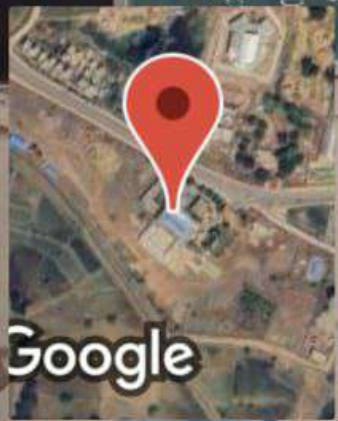
Measurable Rectangle - Let  $(X, \mathcal{F}, \mu)$  and  $(Y, \mathcal{G}, \nu)$  be two measurable space.  
 Let  $A$  be a measurable subset of  $X$ .  
 and  $B$  be a measurable subset of  $Y$ .

then  $A \times B$  is called measurable rectangle of  $X \times Y$ .

Let  $\{(A_i \times B_i)\}$  be disjoint collection rectangle  $A \times B$ .

Main Proof - Let  $(X, \mathcal{F}, \mu)$  and  $(Y, \mathcal{G}, \nu)$  be two measurable space.  
 Let  $A$  be a measurable subset of  $X$ .  
 i.e.  $A \in \mathcal{F}$ .  
 such that  $A = \{A_i\}$   
 and  $B$  be a measurable subset of  $Y$ .  
 i.e.  $B \in \mathcal{G}$ .  
 st.  $B = \{B_i\}$   
 Then  $A \times B \in \mathcal{F} \times \mathcal{G}$ .

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Green Board Presentation - 2023  
 Subject - Functional Analysis  
 Carathéodory - Extension Theorem

Let  $\mu$  be a measure on an algebra  $\mathcal{A}$ .  
 Let  $\mu^*$  be the outer measure induced by  $\mu$ .  
 Then  $\mu^*$  is an extension of  $\mu$  to the  $\sigma$ -algebra containing  $\mathcal{A}$  if  $\mu$  is finite.

Let  $\mu$  be a measure on an algebra  $\mathcal{A}$ .  
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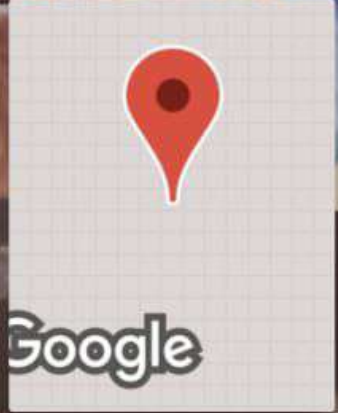
Let  $\mu$  be a measure on an algebra  $\mathcal{A}$ .  
 Let  $\mu^*$  be the outer measure induced by  $\mu$ .  
 Then  $\mu^*$  is an extension of  $\mu$  to the  $\sigma$ -algebra containing  $\mathcal{A}$  if  $\mu$  is finite.



Let  $\mu$  be a measure on an algebra  $\mathcal{A}$ .  
 Let  $A \in \mathcal{A}$ .  
 Then  $A$  is measurable w.r.t to  $\mu^*$ .  
 Setting  $A_n = A$  and  $A_n = \emptyset$  for  $n \geq 2, 3, \dots$   
 By the def of  $\mu^*$ .  
 $\mu^*(A) = \inf \left\{ \sum_{n=1}^{\infty} \mu(A_n) \mid A \subset \bigcup_{n=1}^{\infty} A_n \right\}$   
 $\Rightarrow \mu^*(A) \leq \sum_{n=1}^{\infty} \mu(A_n)$   
 $\Rightarrow \mu^*(A) \leq \mu \left( \bigcup_{n=1}^{\infty} A_n \right) \quad [ \because A \subset \bigcup_{n=1}^{\infty} A_n ]$   
 $\Rightarrow \mu^*(A) \leq \mu(A) \quad \text{--- (1)}$   
 Again  $A \subset \bigcup_{n=1}^{\infty} A_n$   
 $\Rightarrow \mu(A) \leq \mu \left( \bigcup_{n=1}^{\infty} A_n \right)$   
 $\Rightarrow \mu(A) \leq \sum_{n=1}^{\infty} \mu(A_n)$

$\Rightarrow \mu(A) = \inf \left\{ \sum_{n=1}^{\infty} \mu(A_n) \mid A \subset \bigcup_{n=1}^{\infty} A_n \right\}$   
 $\Rightarrow \mu(A) = \mu^*(A)$   
 This shows that  $A$  is measurable w.r.t to  $\mu^*$ .  
 Let  $A$  be a  $\mu^*$ -measurable set.  
 Then  $\mu^*(A) = \mu(A)$  if  $A \in \mathcal{A}$ .  
 Hence,  $\mu^*$  is an extension of  $\mu$  to the  $\sigma$ -algebra containing  $\mathcal{A}$ .  
 Also, if  $\mu$  is finite then clearly  $\mu^*$  is also finite.  
 If  $\mu$  is  $\sigma$ -finite and let  $\beta$  be the  $\sigma$ -algebra containing  $\mathcal{A}$  and  $\mu^*$  is extension of  $\mu$  and  $\mu^*$  is defined on  $\beta$ .  
 To show that  $\mu^*$  is unique.  
 Let  $\nu$  be a measure on  $\beta$  and  $\nu$  is an extension of  $\mu$ .  
 Then  $\nu(A) = \mu(A) \quad \forall A \in \mathcal{A}$ .  
 $\Rightarrow \nu$  is an extension of  $\mu^*$ .  
 $\therefore \nu(A) = \mu^*(A) \quad \forall A \in \beta$ .  
 Hence,  $\mu^*(A) = \mu(A) \quad \forall A \in \mathcal{A}$ .  
 This shows that  $\mu^*$  is unique.

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Name: Parashant Kumar 04/11/2023 "Black Board Presentation" / Subject: F.A.

Theorem: Prove that countable union of Positive set is Positive.

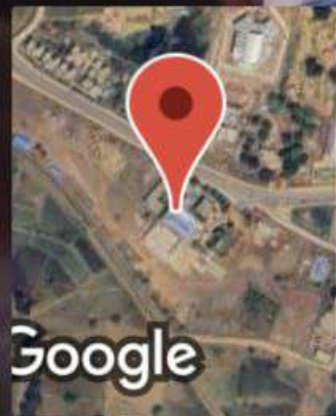
Required Definition:

(1) Positive set (negative set)

Positive Set: A set  $B$  is said to be positive set, if  $\nu \geq 0$  on any subset of  $B$ .

Example: Let  $B = \{1, 2, 3\}$  and a function  $\nu$  defined as  $\nu(x) = x-1$ .

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B	C	D
8 <sup>th</sup>	10 <sup>th</sup>	12 <sup>th</sup>
मशाला	माइला (उभो)	परमल
नौही	रवली	अरली
खट्टी	सिपकोटा	अरली
आमकी	गुजरा	अरली
सिकोला	तरिदार	अरली
बंदना	गनदो	अरली
गारेवा	महकाकला	अरली
सोस्मा	पोडा	अरली
पंदर	अरोडा	अरली
खट्टी	अरोडा	अरली
मोगर	अरोडा	अरली
केनावा	अरोडा	अरली
कुंठली	अरोडा	अरली
कसही	अरोडा	अरली
हकी गंठरा	अरोडा	अरली

## Defuzzification Method

- (I) Center of Area Method.
- (II) Center of Maxima method.
- (III) Mean of maxima method.

### 1) Center of Area method:-

This method is also called the center of gravity method or centroid method.

The fuzzified value  $d_{CA}(c)$  is defined as the value within the range of variable.

$$d_{CA}(c) = \frac{\int_{-c}^c c(z) z dz}{\int_{-c}^c c(z) dz}$$

For discrete case

$$d_{CA}(c) = \frac{\sum_{k=1}^n c(z_k) z_k}{\sum_{k=1}^n c(z_k)}$$

$\forall k: 1, 2, \dots, n.$

### 2) Center of Maxima method:-

$$d_{CM}(c) = \frac{\inf M + \sup M}{2}$$

where  $M = \{z \in [c, \bar{c}] \mid c(z) = h(c)\}$

### 3) Mean of maxima method

$$d_{MM}(c) = \frac{\sum_{k=1}^n c^*(z_k) z_k}{|M|}$$

$\Rightarrow f(c) = \sum_{k=1}^n \frac{1}{\sigma_k} \left| \frac{f(z_k)}{c(z_k)} \right| dz_k$   
 (where  $z_k \in \frac{m}{\sigma_k}$ )

$B \in I = 20 - 12$   
 $M \in I = 12 - 12.40$   
 $B \in II = 40 - 120$   
 $B \in III = 1.20 - 2.00$   
 $M \in III = 2.20 - 3.00$

$\Rightarrow f(c) = \int_{c-z_0}^c \frac{f(z)}{c(z)} dz$



MSc - IV sem

# Group Discussion Sub - F.A.

Date  
16/04/24

Time  
12:30 PM

## Closed Range Theorem

Statement :- Let  $X$  and  $Y$  be Hilbert Space and  $A \in B(X, Y)$ . Then  $R(A)$  is closed and  $R(A^*)$  is closed.



Let  $Y_0 = R(A)$

Then  $Y_0$  is a closed

Since  $A: X \rightarrow Y$  be define

$A_0 = R(A^*)$

$A_0$  is bounded linear trans

Proof :- Let  $X$  and  $Y$  be Hilbert space.

Let  $A \in B(X, Y)$

i.e  $A$  is bounded linear Transformation space.



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MSc - D.T. 2024  
Group Discussion  
Date: 16/04/24 Time: 12:30 PM  
Sub - Mechanics

Statement :- [ Euler Poisson Eqn ]

Among all functions  $y(x)$  belong to the  $D_1[a, b]$  and satisfies the condition  $y^{(i)}(a) = A$  ,  $y^{(i)}(b) = 0$   $\forall 0 \leq i \leq n-1$

Find the function for which the functional  $J[y] = \int_a^b F(x, y, y', y'', \dots, y^{(n)}) dx$  has an extremum.

Proof :- We have  $J[y] = \int_a^b F(x, y, y', y'', \dots, y^{(n)}) dx$  ①

We consider the perturbation  $\delta y \in D_1[a, b]$  and satisfies the boundary condition  $\delta y^{(i)}(a) = \delta y^{(i)}(b) = 0$

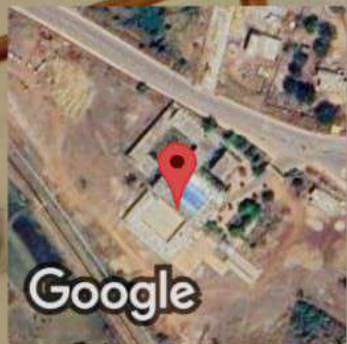
Replacing  $y = y(x) + \delta y(x)$  in ① we get

$$J[y + \delta y] = \int_a^b F(x, y + \delta y, y' + \delta y', \dots, y^{(n)} + \delta y^{(n)}) dx$$

we have that

$$\Delta J = J[y + \delta y] - J[y]$$

(from ① and ②)



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MSc - D1

**Group Discussion**  
**Sub-Mechanics**

Ques. Solve the following  
 $L = \frac{1}{2} \dot{\theta}^2 + \frac{1}{2} \dot{\phi}^2 - g\theta^2$

Q501 - Given that  
 $L = \frac{1}{2} \dot{\theta}^2 + \frac{1}{2} \dot{\phi}^2 - g\theta^2$  — (1)  
 Diff. w.r.to  $\theta$   
 $\frac{\partial L}{\partial \theta} = \dot{\phi}^2 - 2g\theta$   
 $\frac{\partial L}{\partial \dot{\theta}} = \dot{\theta}$

Again diff. w.r.to  $t$   
 $\frac{\partial L}{\partial \theta} = \dot{\phi}^2 - 2g\theta$   
 $\frac{\partial L}{\partial \dot{\theta}} = \dot{\theta}$   
 & by Lagrangian eq.  
 $\frac{d}{dt} \left( \frac{\partial L}{\partial \dot{\theta}} \right) - \frac{\partial L}{\partial \theta} = 0$



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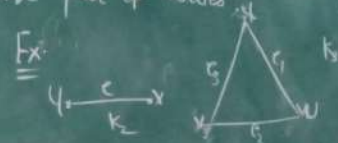


MSC-III Sem  
Black Board PPT

Topic- Graph theory

Lemma: Every graph on  $(k+1)$  vertices contain either a complete subgraph on  $(k+1)$  vertices or an independent set of  $(k+1)$  vertices

Definition: # Complete Subgraph: A graph is a complete subgraph if  $\exists$  an edge for each pair of vertices



Proof: We apply the induction  
Let  $G_1$  be a graph with  $(k+1)$  vertices  
Basic Definition  
Here graph  $G_1$  has  $(k+1)$  vertices  
 $v_1, v_2, \dots, v_{k+1}$

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