MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Course Title	**Mathematics for Computer Science Engineering stream -2**		
Course Code	22MATS21	**(L-T-P)C**	(3-1-2-4)
SEE duration	3 hour	**Hours / Week**	06
CIE (Theory) marks	30	**CIE (Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	70

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, number theory, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2

Course Contents:

MODULE –1	**10 Hrs.**

Differential Equations of First order First Degree (DE): Solution of exact differential equations.

Higher Order Differential Equations Linear differential equation with constant coefficients - Solutions of homogeneous equations.Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms; exponential, polynomial, trigonometric and their product.

Self – study: Linear differential equations, Bernoulli's differential equations. Method of variation of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1.Orthogonal trajectories in Cartesian form,

illustrative examples.

MODULE –2	10 Hrs.

Numerical solution of first order, first degree ODE: Taylor series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss Seidel iteration method.

Numerical solution of a Laplace equation, Poisson equation by finite difference approximation methodusing standard fivepoint formula, diagonal formula and iterative formulas.

Self–study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace's equation. Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by RK method.

MODULE –3	10 Hrs.

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigidbody, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stokes theorem and Illustrative examples from engineering field.

Self – study: Gauss divergence theorem, Illustrative examples from engineering field.

MODULE – 4	10 hrs.

Applications in computer science engineering:

Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, carbon dating-half-life period, mixing problem involving one tank, two tank.

To mesuare the change over all concentration of glucose in blood when glucose is fed. continuous compounding.

Number theory -Properties of integers- division algorithem, GCD and LCM , Congruence relations, residue classes, congruence equations, applications of congruences on cryptography.

Self study- Applications of line integral- finding projectile height from its acceleration, initial velocity, initial position.Applications connected with Differential equations and vector calculus.

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

List of Programmes:

1. Solution of first order ordinary differential equation using Taylor series & Range-kutta method.
2. Solution of partial differential equation (Laplace & Poisson equations)
3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Gauss elimination method.
7. Solution of 2^{nd} order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by Range-kutta method.
9. Solution of system of linear equations using Gauss-Seidal iteration method.
10. Product of matrices & finding Inverse of a matrix.

NOTE:

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Text Books :

1.Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.

2.Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

3 .Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

Reference Books:

1.R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6thedition, 2014.

2.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Course Title	**Mathematics for Electrical and Electronics Engineering stream-2**		
Course Code	22MATE21	**(L-T-P)C**	(3-1-2-4)
SEE duration	3 hours	**Hours / Week**	06
CIE (Theory) marks	30	**CIE (Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	70

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2

Course Contents:

MODULE –1	**10 Hrs.**

Differential Equations of First order First Degree (DE): Solution of exact differential equations.

Higher Order Differential Equations, Linear differential equation with constant coefficients - Solutions of homogeneous equations.Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms; exponential, polynomial, trigonometric and their product.

Self-study: Linear differential equations, Bernoulli's differential equations. Method of variation of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1.Orthogonal trajectories in Cartesian form, illustrative examples.

MODULE –2	**10 Hrs.**

Numerical solution of first order, first degree ODE: Taylor series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss Seidel iteration method.

Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method--using standard fivepoint formula, diagonal formula and iterative formulas.

Self – study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace's equation. Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by Range-kutta method.

MODULE –3	**10 Hrs.**

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigidbody, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stokes theorem and Illustrative examples from engineering field.

Self – study: Gauss divergence theorem, Illustrative examples from engineering field.

MODULE – 4	**10 hrs.**

Applications in Electrical Engineering:

Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, carbon datinghalf-life period, mixing problem involving one tank, two tank. voltage in a discharging capacitor.

Modelling using difference equations- Growth of a Yeast Culture, spread of a Contagious Disease, Decay of Digoxin in the Blood stream, Solutions to Dynamical system .Linear dynamical system $a_{n+1} = ra_n$, $a_{n+1} = ra_n + b_n$, Sewage Treatment, Prescription for Digoxin.Applications of second-order differential equations$lQ^{II}(t) + RQ^{I}(t) + \frac{1}{C}Q(t) = E(t)$.-transient analysis of electrical net works**,** Modelling projectile motion(vector approach).

Self Study-Introduction to graph theory, types of graphs, subgraphs, trees, spanning subgraphs, shortest path algorithms.

List of Programmes:

1. Solution of first order ordinary differential equation using Taylor series & Range-kutta method.
2. Solution of partial differential equation (Laplace &Poisson equations)
3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Gauss elimination method.
7. Solution of 2^{nd} order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by Range-kutta method.
9. Solution of system of linear equations using Gauss-Seidel iteration method.
10. Product of matrices & finding Inverse of a matrix.

NOTE:

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Text Books :

1.Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.

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3.Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

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1.R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6thedition, 2014.

2.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Course Title	**Mathematics for Mechanical Engineering -2**		
Course Code	22MATM21	**(L-T-P)C**	(3-1-2-4)
SEE duration	3 hours	**Hours / Week**	06
CIE (Theory) marks	30	**CIE (Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	70

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) that are connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2

Course Contents:

MODULE –1	**10 Hrs.**

Differential Equations of First order First Degree (DE): Solution of exact differential equations.

Higher Order Differential Equations Linear differential equation with constant coefficients - Solutions of homogeneous equations.Particular solution of non - homogenous differential equations by inverse differential operator method for the following standard forms; exponential, polynomial, trigonometric and their product.

Self-study: Linear differential equations, Bernoulli's differential equations. Method of variation of parameters to solve linear differential equation with constant coefficients. Matrix method to

solve homogeneous differential equations of order 2, degree 1.Orthogonal trajectories in Cartesian form, illustrative examples

MODULE –2	10 Hrs.

Numerical solution of first order, first degree ODE: Taylor series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods. **Partial Differential Equations**: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss Seidel iteration method.

Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method--using standard fivepoint formula, diagonal formula and iterative formulas.

Self – study: To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace's equation. .Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by Range kutta method.

MODULE –3	10 Hrs.

Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigid body, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field.

Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stokes theorem and Illustrative examples from engineering field.

Self -study: Gauss divergence theorem, Illustrative examples from engineering field.

MODULE – 4	10 hrs.

Applications in Mechanical Engineering:

Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, Modelling of infected diseases, carbon dating-half-life period, mixing problem involving one tank, two tank. Newton's law of cooling, to compute the time required to drain the tank, resistance force opposing the motion, growth and decay-radioactivity.

Applications of second order, first degree Differential equations -Applications of second order, first degree Differential equations –Mechanical Vibrations-A Spring mass system $mu^{II}(t) + ku^{I}(t) + gu(t) = f(t)$-Undamped free vibrations, damped free vibrations, forced vibrations with damping, --forced vibrations without damping,. Applications to find the orthogonal trajectories - streamlines of flow in the channel, curves of constant temperature in a body equi-potential lines in an electric field between two concentric cylinders.

Self-study- Application of first order differential equation- Autonomous equation and population dynamics-Application- Logistic model- Natural growth of halibut population in certain areas of pacific ocean, Harvesting a renewable resources. Application of eigen values of 2×2 matrices. Modelling projectile motion(vector approach).

List ofProgrammes:

1. Solution of first order ordinary differential equation using Taylor series & Range-kutta method.
2. Solution of partial differential equation (Laplace &Poisson equations)
3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Gauss elimination method.
7. Solution of 2^{nd} order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by Range-kutta method.
9. Solution of system of linear equations using Gauss-Seidel iteration method.
10. Product of matrices & finding Inverse of a matrix.

NOTE:

1.Proofs are not required for any theorems and properties.

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3.Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

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1.R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6thedition, 2014.

2.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Course Title	**Mathematics for Civil Engineering-2**		
Course Code	22MATC21	**L-T-P-C**	(3-1-2-4)
SEE duration	3 hours	**Hours / Week**	06
CIE (Theory) marks	30	**CIE (Practicals)/Activity marks**	20
SEE marks	50	**Total contact hours**	70

Course Objective: To train the students to acquire knowledge in Differential equations and vector calculus so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to

COs	Outcomes	PO1	PO2
CO1	Apply suitable methods to solve the simple problems of ordinary differential equations/partial differential equations and vector calculus, analytically/numerically.	3	-
CO2	Examine the higher order problems (more difficult problems) thatare connected with differential equations/partial differential equations and solve.	3	2
CO3	Introspect the geometry of the region to compute the vector integration problems of gauss divergence theorem, stokes theorem, greens theorem.	3	2
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	3	2

Course Contents:

MODULE –1	**10 Hrs.**

Differential Equations of First order First Degree (DE): Solution of exact differential equations,

Higher Order Differential Equations, Linear differential equation with constant coefficients - Solutions of homogeneous equations.Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product.

Self – study: Linear differential equations, Bernoulli's differential equations. Method of variation of parameters to solve linear differential equation with constant coefficients. Matrix method to solve homogeneous differential equations of order 2, degree 1.Orthogonal trajectories in Cartesian

form, illustrative examples.	
MODULE –2	**10 Hrs.**
Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods. **Partial Differential Equations**: Solving PDE by variable separable method, To find all possible solutions of one-dimensional wave equation, solution of system of equations by Gauss -Seidel iteration method. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation methodusing standard five pointformula, diagonal formula and iterative formulas. **Self-study:** To find all possible solutions of one-dimensional heat equation, two-dimensional Laplace equation. Numerical solution of Simultaneous differential equations, numerical solution of second order differential equations by RK method.	
MODULE –3	**10 Hrs.**
Vector Calculus: Velocity & acceleration of a vector point function, moment of a force, velocity of a rotating body, rotation of a rigid body, Gradient, divergence & curl. Physical & Geometrical Interpretation of dot product, Gradient, divergence & curl, irrotational vectors, illustrative examples from engineering field. Line integrals, surface integrals and volume integrals, Statement of Green's theorem, Stoke's theorem and Illustrative examples from engineering field. **Self – study:** Gauss divergence theorem, Illustrative examples from engineering field.	
MODULE – 4	**10 hrs.**
Applications in civil engineering: Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. Modelling of infected diseases, carbon datinghalf-life period, mixing problem involving one tank, two tank. **Applications of second order, first degree Differential equations** -Applications of second order, first degree Differential equations –Mechanical Vibrations-A Spring mass system $mu^{II}(t) + ku^{I}(t) + gu(t) = f(t)$-Undamped free vibrations, damped free vibrations, forced vibrations with damping, --forced vibrations without damping, Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body. equi-potential lines in an electric field between two concentric cylinders**.**	

DEPARTEMENT OF MATHEMATICS

Self-study- Application of first order differential equation- Autonomous equation and population dynamics-Application- Logistic model- Natural growth of halibut population in certain areas of Pacific Ocean, Harvesting a renewable resource. motion of a simple pendulum, Deflection of beams.

Modelling projectile motion(vector approach),

List of Programmes:

1. Solution of first order ordinary differential equation using Taylor series & Runge-kutta method.
2. Solution of partial differential equation (Laplace & Poisson equations)
3. Finding gradient , divergence and curl.
4. Computation of area, volume and center of gravity.
5. Verification of Green's theorem in vector integration.
6. Solution of system of equations by Gauss elimination method.
7. Solution of 2^{nd} order differential equations(by variation of parameter method).
8. Numerical solution of simultaneous differential equations by Range-kutta method.
9. Solution of system of linear equations using Guass-Seidal iteration method.
10. Product of matrices& finding Inverse of a matrix.

NOTE:

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2.There should not be any questions from self study part in semester End Examination.

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3. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.

Reference Books:

1. R K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age international pvt. Publishers, 6thedition, 2014.

2.N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Articulation Matrix

Course Title: Statistics and Probability
Course Code: 21MA401

Credits (L-T-P-S): 2-1-0-3

Course Type (Core/Elective): Core

A **Course Outcomes**

Course Objective: To introduce the concept of probability distribution functions, hypothesis testing, complex analysis so as to apply in engineering application problems.

Course Outcomes: At the end of the course students will be able to

COs	Outcomes
CO1	Fit a suitable curve/regression line for the given experimental data, probability and joint probability.
CO2	Validate an assumption through "hypothesis testing" (that is the assumption is not simply because of chance).
CO3	Analyze the problems connected with probability to apply suitable probability distribution and also, predict the probability in the long run for Markov chain based problems.
CO4	Model real life problems/engineering application problems and solve the same.

B **CO-PO mapping**

	PO1	PO2
CO1	**3**	**-**
CO2	**3**	**2**
CO3	**3**	**2**
CO4	**3**	**2**

Course Contents:

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Module-1	**Statistics:** Correlation - Karl Pearson coefficient of correlation and Spearman's rank correlation coefficient. Physical interpretation of numerical value of the rank correlation coefficient. Linear Regression analysis (when the experimental output depends on one input). Illustrative examples from engineering field, multiple regression analysis. (When the experimental output depends on two inputs). **Probability: Discrete Random Variables**: Definitions of PDF & CDF:Expectation and Variance:Binominal pdf- Illustrative examples. **Self-study/Applications:** Poisson probability distribution function-Illustrative examples.	7 Hours
Module–2	**Continuous Random Variables:** Definition of PDF and CDF, Expectation and Variance, illustrative examples **Probability distribution:** Exponential pdf, Normal/Gaussian pdf. Discussion on the choice of PDF. Illustrative examples from engineering field. **Self-study/Applications:**Uniform pdf, Current measurement problems, Digital transmission channel. . Detection of signal.	7 Hours
Module–3	**Confidence intervals & Hypothesis analysis:** Introduction, Testing a hypothesis, central limit theorem-statement, Level of significance, Simple sampling of attributes, confidence intervals, Test of significance for large samples, Comparison of large samples, Student's t-distribution, Chi-square distribution. **Self-study/Applications:** Propellant burning rate, process-capacity problem, drying time problem, Two catalyst effect on chemical reaction.	7 Hours
Module–4	**Joint Probability Distribution & Stochastic Processes**: Concept of joint probability, Joint distributions of discreterandom variables, Independent random variables-problems. Joint expectation, co-variance and correlation. **Markov Chains:** Introduction, stochastic matrices, fixed probability vectors and regular stochastic matrices. Application of Markov chain to determine the voting tendencies. **Self-study/Applications:** Estimating the population distribution of a city due to migration.	7 Hours

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

Note - Theorems and properties without proof. Applicable to all the modules.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44thEdition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd 9th edition, 2014.
3. B V Ramana Higher Engineering Mathematics, Tata McGraw Hill Publications, 2nd edition, 2007.

Reference Books:

1. Scott L.Miller, DonaldG. Childers: "Probability and Random Process with application to Signal Processing", Elsevier Academic Press, 2nd Edition, 2013.
2. Statistics for engineers and Scientists, William Navide, Mc-Graw hill education, India pvt. Ltd., 3rd edition 2014.
3. T.Veerarajan: "Probability, Statistics and Random Process", 3rd Edition, Tata McGraw Hill Co., 2008.
4. Theory and problems of probability, Seymour Lipschutz and marclarslipson, Schaum out line series, 2nd edition.

ACTIVITIES:

1. Negative binomial distribution: Failure of server's problems,
2. Poissondistribution: Contamination problem, flaws in wires.
3. Exponential distribution: lack of memory property.
4. Continuous random variable: Shaft conforms.
5. Continuous random variable: detection of signal, Digital transmission channel.
6. Hypothesis analysis Depression treatment.
7. Hypothesis analysis defect in printed circuit board.
8. Confidence levels: Doping the cement with lead effect on percentage of calcium.
9. Current measurement problems, Propellant burning rate, process-capacity problem, drying time problem, Two catalyst effect on chemical reaction.
10. Application of Markov chain in estimating the population distribution of a city due to migration.
11. Application of Multiple regression when exp. output depends on 3, 4,.5 inputs.
12. Application of Markov chain to determine the voting tendencies.
13. Curve fitting.

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MATHEMATICS

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