KL UNIVERSITY
M.Phil / PRE-Ph.D EXAMINATION
DEPARTMENT OF MATHEMATICS
SYALLABUS
PAPER-II
MATHEMATICAL METHODS AND STOCHASTIC PROCESSES

Unit-1:
Numerical Analysis:
Numerical solution of simultaneous Linear equations Gauss reduction- Crout Reduction-gauss Jordan Reduction – inverse Of Matrix-Iterative methods-gauss seidel iteration ,Relaxation, Inherent errors
Numerical solution of Non-linear equations-Regular Falsi -Newton Raphson method Iterative Method of Higher order –Solutin of set of Non-Linera ewquations
Graffe's root squaring technique,Bairstow Iteration-scaling Method

Unit-II
Laplace transforms:

The Laplace Transform ,the Inverse Laplace Transform, application to differential equation and Integral and difference equations

Stochastic process:

Unit:III
Stochastic process, Markov chains

Unit:IV:

Markov processes with discrete state space-Poisson process and it s extensions

Unit-V

Markov process with continuous state space

SCOPE OF T HE SYALLABUS;

For unit -1 ,Introduction to Numerical analysis(2^{nd}Edition)by F.B.hiller Band,Tata Mc Graw Hill Publishing company Ltd.

For Unit-II chapter 1to IV in Theory and problems of laplace transformation by Murray B.Spegel Schaum's outline series,McGraw-Hill book company(1989)

For Unit III,IV&V Stichastic process, Medhi.J.Wiley eastern Limited .
Note:
Two- questions on each units I&II
One - questions on each units III&IV&V
One - questionof short notes type are to be set
Five questions to be answered out off 8 questions.

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MODEL QUESTION PAPER
PAPER-II MATHEMATICAL METHOD AND STOCHASTIC PROCESSES

Time: 3Hours **Max. Marks: 100**

Answer any Five of the following:

1. (a) Describe the Gauss-Seidal iterative method for solving a system of linear equations.
   (b) Solve the following system equations by Gauss-Jordan reduction method.
   $$10x_1 + 7x_2 + 8x_3 + 7x_4 = 32$$
   $$7x_1 + 5x_2 + 6x_3 + 5x_4 = 23$$
   $$8x_1 + 6x_2 + 10x_3 + 5x_4 = 33$$
   $$7x_1 + 5x_2 + 5x_3 + 10x_4 = 31$$
2. (a) Describe Graffe's root-squaring technique to find the roots of polynomial equation.
   (b) Find a root of $x^2 - x - 1 = 0$ by Newton-Raphson method correct up to 4 decimals.
3. Define Laplace Transform and state and prove its properties.
4. (a) Describe solving homogeneous difference equation with constant coefficients
   (b) Solve the difference equation
   $U_n = \frac{1}{2}(U_{n+1} + U_{n-1}), 1 \le n \le a - 1$ with initial conditions $U_0 = 1$ and $U_a = 0$
5. (a) Define a Markov chain and discuss the classification of states in Markov chain.
   (b) If $P = \begin{bmatrix} 1-a & a \\ b & 1-b \end{bmatrix}, 0 < a, b < 1$, is the transition probability matrix of a Markov chain, then find its stationary distribution
6. (a) Derive Poisson process stating the postulates.
   (b) If $\{N(t)\}$ is a Poisson Process and $s < t$, find $P\left(N(s) = \frac{k}{N(t)} = n\right)$.
7. (a) Define Wiener processes and derive its differential equations.
   (b) If $\{X(t), 0 < t\}$ is a Wiener process with $X(0) = 0$ and $\mu = 0$, then find $P(X(t) = x)$.
   Find the matrix of the complimentary distribution functions of the waiting times.
8. Write short notes on any three of the following:
   (a) Solution of equations by Cotut's method
   (b) Inverse Laplace transformation
   (c) Classification of stochastic processes
   (d) Time dependent Poisson processes
   (e) Stationary of a Markov chain