VASAVI COLLEGE OF ENGINEERING (Autonomous)
Department of Mathematics

SYLLABUS FOR RECRUITEMENT TEST OF ASSISTANT PROFESSOR

SUBJECT: MATHEMATICS

Duration: 3 hours

Unit-I

Differential Calculus
Introduction to Mean Value Theorems with Geometrical Interpretation(Without Proofs) - Taylor's Series – Expansion of functions in power series- Curvature- Radius of Curvature (Cartesian and Parametric co-ordinates) – Centre of Curvature –Evolutes – Envelopes of one parameter family of curves.

Multivariable Calculus
Limits- Continuity -Partial Derivatives-Higher Order Partial Derivatives-Total Derivates - Derivatives of Composite and implicit functions - Taylor's series of functions of two variables - Maxima and Minima of functions of two variables with and without constraints - Lagrange's Method of multipliers.

Vector Differential Calculus
Scalar and Vector point functions -Vector Differentiation-Level Surfaces-Gradient of a scalar point function- Normal to a level surface- Directional Derivative – Divergence and Curl of a Vector field-Conservative vector field

Vector Integral Calculus
Multiple integrals: Double and Triple integrals (Cartesian) - Change of order of integration(Cartesian Coordinates).

Vector Integration: Line, Surface and Volume integrals- Green's Theorem – Gauss Divergence theorem - Stokes's Theorem. (all theorems without proof).

Unit-II

Ordinary Differential Equations of first order
Exact first order differential equations - Integrating factors- Linear first order equations – Clairaut's equation - Applications of First Order Differential Equations -Orthogonal trajectories (Cartesian families) – LR and RC Circuits.

Linear Differential equations
Solutions of Homogeneous and Non Homogeneous equations with constant coefficients- Method of Variation of Parameters –Applications of linear differential equations to LCR circuits

Partial Differential Equations

Formation of first and second order Partial Differential Equations - Solution of First Order Equations – Linear Equation - Lagrange's Equation - Non-linear first order equations – Standard Forms.

Applications of Partial Differential Equations

Method of Separation of Variables - One Dimensional Wave Equation- One Dimensional Heat Equation – Two Dimensional Heat equation Laplace's Equation-(Temperature distribution in long plates).

Unit-III

Matrices

Rank of a Matrix- Linearly independence and dependence of Vectors - Characteristic equation- - Eigen values and Eigenvectors - Physical Significance of Eigen values - Cayley - Hamilton Theorem (without proof)- Diagonalization using Similarity Transformation.

Infinite Series

Sequences- Series – Convergence and Divergence- Series of positive terms-Geometric series- p-series test - Comparison tests - D'Alemberts Ratio Test – Cauchy's root test - Alternating Serie–Leibnitz test – Absolute and Conditional convergence.

Complex Variables (Differentiation)

Limits and Continuity of function - Differentiability and Analyticity - Necessary & Sufficient Condition for a Function to be Analytic - Milne-Thompson's method -Harmonic Functions.

Complex Integration

Complex Integration- Cauchy's Theorem - Extension of Cauchy's Theorem for multiply connected regions- Cauchy's Integral Formula - Power series - Taylor's Series - Laurent's Series (without proofs) –Poles and Residues.

Unit-IV

Laplace Transforms

Introduction to Laplace transforms - Inverse Laplace transform - Sufficient Condition for Existence of Laplace Transform –Properties of Laplace Transform- Laplace Transform of Derivatives - Laplace Transform of Integrals - Multiplication by t^n - Division by t – Evaluation of Integrals by Laplace Transforms- Convolution Theorem - Application of Laplace transforms to Initial value Problems with Constant Coefficients.

Fourier series

Introduction to Fourier series – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of Interval - Fourier series expansions of even and odd functions - Fourier Expansion of Half- range Sine and Cosine series.

Fourier Transforms

Fourier Integral Theorem (without Proof) - Fourier Transforms – Inverse Fourier Transform - Properties of Fourier Transform –Fourier Cosine & Sine Transforms.

Unit-V

Probability:

Random Variables - Discrete and Continuous Random variables-Properties- Distribution functions and densities - Expectation – Variance –Normal Distributions.

Test of Hypothesis

Introduction -Testing of Hypothesis- Null and Alternative Hypothesis -Errors- -Level of Significance-Confidence Intervals -Tests of Significance for small samples - t-test for single mean - F- test for comparison of variances - Chi-square test for goodness of fit..

Regression & Correlation

The Method of Least Squares - Fitting of Straight line- Regression - Lines of Regression-Correlation – Karl Pearson's Co-efficient of Correlation

Interpolation

Finite Differences- Interpolation- Newton's Forward and Backward Interpolation Formulae – Interpolation with unequal intervals – Lagrange's Interpolation Formula – Divided differences-Newton's Divided difference formula.

Numerical solutions of ODE

Numerical Differentiation -Interpolation approach- Numerical Solutions of Ordinary Differential Equations of first order - Taylor's Series Method - Euler's Method - Runge-Kutta Method of 4th order(without proofs).

Note:
1. The written test paper consist two parts
2. Part-A   30 Marks (10 questions 3 marks each)
3. Part-B   70 Marks   (Answer any 5 questions of 7)
4. Scientific Calculator is allowed.