THIRD SEMESTER

MTS3 C03:MATHEMATICS-3

5 hours/week 3 Credits 75 Marks[Int.15 + Ext. 60]

Text Advanced Engineering Mathematics(6/e) : Dennis G Zill Jones & Bartlett Learning, LLC(2018)ISBN: 978-1-284-10590-2

Module I 21 hrs 9.1: Vector Functions – Vector-Valued Functions, Limits, Continuity, and Derivatives, Geometric Interpretation of 𝑟′(𝑡), Higher-Order Derivatives, Integrals of Vector Functions, Length of a Space Curve, Arc Length as a Parameter

9.2: Motion on a Curve-Velocity and Acceleration, Centripetal Acceleration, Curvilinear Motion in the Plane

9.3: Curvature and components of Acceleration- definition, Curvature of a Circle, Tangential and Normal Components of Acceleration, The Binormal, Radius of Curvature

9.4: Partial Derivatives-Functions of Two Variables, Level Curves, Level Surfaces, Higher-Order and Mixed Derivatives, Functions of Three or More Variables, Chain Rule, Generalizations

9.5: Directional Derivative-The Gradient of a Function, A Generalization of Partial Differentiation, Method for Computing the Directional Derivative, Functions of Three Variables, Maximum Value of the Directional Derivative, Gradient Points in Direction of Most Rapid Increase of f

9.6: Tangent planes and Normal Lines-Geometric Interpretation of the Gradient, Tangent Plane, Surfaces Given by 𝑧 = (𝑥,𝑦), Normal Line

Module II 24 hrs 9.7: Curl and Divergence-Vector Fields, definition of curl and divergence, Physical Interpretations

9.8: Line Integrals-definition of smooth.closed and simple closed curves, Line Integrals in the Plane, Method of Evaluation-curve as explicit function and curve given parametrically, Line Integrals in Space, Method of Evaluation, Work, Circulation

9.9: Independence of Path- Conservative Vector Fields, Path Independence, A Fundamental Theorem, definition of connected,simply connected and multiconnected

87

regions, Integrals Around Closed Paths, Test for a Conservative Field, Conservative Vector Fields in 3-Space, Conservation of Energy

9.10: Double Integral- Integrability, Area, Volume, Properties, Regions of Type I and II, Iterated Integrals, Evaluation of Double Integrals (Fubini theorem), Reversing the Order of Integration, Laminas with Variable Density—Center of Mass, Moments of Inertia, Radius of Gyration

9.11: Double Integrals in Polar Coordinates- Polar Rectangles, Change of Variables: Rectangular to Polar Coordinates,

9.12: Green’s Theorem- Line Integrals Along Simple Closed Curves, Green’s theorem in plane, Region with Holes,

9.13: Surface Integral- Surface Area, Differential of Surface Area, Surface Integral, Method of Evaluation, Projection of S into Other Planes, Mass of a Surface, Orientable Surfaces, Integrals of Vector Fields-Flux,

9.14: Stokes’s Theorem- Vector Form of Green’s Theorem, Green’s Theorem in 3Space-Stoke’s Theorem, Physical Interpretation of Curl

Module III 21 hrs 9.15:Triple Integral- definition, Evaluation by Iterated Integrals, Applications, Cylindrical Coordinates, Conversion of Cylindrical Coordinates to Rectangular Coordinates, Conversion of Rectangular Coordinates to Cylindrical Coordinates, Triple Integrals in Cylindrical Coordinates, Spherical Coordinates, Conversion of Spherical Coordinates to Rectangular and Cylindrical Coordinates, Conversion of Rectangular Coordinates to Spherical Coordinates, Triple Integrals in Spherical Coordinates 9.16: Divergence Theorem- Another Vector Form of Green’s Theorem , divergence or Gauss’ theorem, ( proof omitted ), Physical Interpretation of Divergence

9.17: Change of Variable in Multiple Integral- Double Integrals, Triple Integrals

17.1: Complex Numbers- definition, arithmetic operations, conjugate, Geometric Interpretation

17.2: Powers and roots-Polar Form, Multiplication and Division, Integer Powers of , DeMoivre’s Formula, Roots

88

17.3: Sets in the Complex Plane- neighbourhood, open sets, domain, region etc. 17.4: Functions of a Complex Variable- complex functions, Complex Functions as Flows, Limits and Continuity, Derivative, Analytic Functions - entire functions 17.5: Cauchy Riemann Equation- A Necessary Condition for Analyticity, Criteria for analyticity, Harmonic Functions, Harmonic Conjugate Functions, 17.6:Exponential and Logarithmic function- (Complex)Exponential Function, Properties, Periodicity, (‘Circuits’ omitted), Complex Logarithm-principal value, properties, Analyticity 17.7: Trigonometric and Hyperbolic functions- Trigonometric Functions, Hyperbolic Functions, Properties -Analyticity, periodicity, zeros etc.

18.1: Contour integral- definition, Method of Evaluation, Properties, MLinequality. Circulation and Net 18.2: Cauchy-Goursat Theorem- Simply and Multiply Connected Domains, Cauchy’s Theorem, Cauchy–Goursat theorem, Cauchy–Goursat Theorem for Multiply Connected Domains, 18.3: Independence of Path- Analyticity and path independence, fundamental theorem for contour integral, Existence of Antiderivative 18.4: Cauchy’s Integral Formula- First Formula, Second Formula-C.I.F. for derivatives. Liouville’s Theorem, Fundamental Theorem of Algebra

References: 1 Soo T Tan: Calculus Brooks/Cole, Cengage Learning(2010 )ISBN 0-53446579-X 2 Gilbert Strang: Calculus Wellesley Cambridge Press(1991)ISBN:0-9614088-20 3 Ron Larson. Bruce Edwards: Calculus(11/e) Cengage Learning(2018) ISBN: 978-1-337-27534-7 4 Robert A Adams & Christopher Essex : Calculus several Variable (7/e) Pearson Education Canada (2010) ISBN: 978-0-321-54929-7 5 Jerrold Marsden & Anthony Tromba : Vector Calculus (6/e) W. H. Freeman and Company ISBN 978-1-4292-1508-4 6 Peter V O’Neil: Advanced Engineering Mathematics(7/e) Cengage Learning(2012)ISBN: 978-1-111-42741-2 7 Erwin Kreyszig : Advanced Engineering Mathematics(10/e) John Wiley & Sons(2011) ISBN: 978-0-470-45836-5 8 Glyn James: Advanced Modern Engineering Mathematics(4/e) Pearson Education Limited(2011) ISBN: 978-0-273-71923-6