Semester-I

BMAT118 (A): CALCULUS

Maximum Time: 3 Hrs. Maximum Time: 3 Hrs.

Maximum Marks: 50 Marks] Internal Assessment: 10

External Marks: 40 Pass Percentage: 35%

Course objective: The objective of the course is to help the students acquire skills to understand concepts of limits and continuity of a function geometrically and geometrical interpretation of various mean value theorems with their applications.

Course learning outcomes: On completion of course ,the student will be able to

CO-I: learn and evaluate concavity, convexity and points of inflexion of a curve.

CO-II: learn basic properties of limits, infinite limits, indeterminate forms.

CO-III: learn and evaluate Continuous functions, types of discontinuities, continuity of composite functions ,uniform continuity

CO-IV: know Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, their geometric interpretation and applications.

CO-V: learn and evaluate Taylor's theorem and Maclaurian theorem with various forms of remainder and their applications

CO-VI: learn and evaluate Euler's theorem and its applications.

INSTRUCTIONS FOR THE PAPER-SETTER /EXAMINER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having twelve short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 7 marks and Section C will be of 12 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Sections A and B and compulsory question of Section C.

SECTION:A

Limits: ε -δ definition of the limit of a function, basic properties of limits, infinite limits, indeterminate forms.

Continuity: Continuous functions, types of discontinuities, continuity of composite functions, sign of a function in a neighborhood of a point of continuity, intermediate value theorem, maximum and minimum value theorem, Uniform continuity

Concavity and convexity, points of inflexion, asymptotes ,curve tracing for Cartesian coordinates only.

SECTION : B

Successive differentiation, Leibnitz's theorem and its applications

Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, their geometric interpretation and applications, Taylor's theorem, Maclaurin's theorem with various form of remainders and their applications

Partial derivatives: homogeneous functions , Euler's theorem and its applications.

Books Recommended:

1. J. D. Murray & M . R. Spiegel : Theory and Problems of Advanced Calculus, Schaum's Outline Series, Schaum Publishing Co., New York.

2. Gorakh Prasad : Differential Calculus, Pothishala Private Ltd., Allahabad.

3. G.B. Thomas & R.L. Finney : Calculus and Analytic Geometry (Ninth Edition), Pearson Publication. 4.Shanti Narayan and P.K. Mittal : Differential Calculus, Edition 2006, S. Chand &Co., New Delhi.

BMAT118 (B): ALGEBRA AND TRIGONOMETRY

Maximum Time: 3 Hrs. Maximum Time: 3 Hrs.
Maximum Marks: 50 Marks] Internal Assessment: 10
External Marks: 40 Pass Percentage: 35%

Course objective: The objective of the course is to help the students acquire skills to do calculations like finding roots of a polynomial using different methods, solving simultaneous linear equation system and solving problems related to trigonometry with ease.

Course learning outcomes: On completion of course ,the student will be able to

CO-I: learn and evaluate D'Moivre's theorem and apply it to solve numerical problems.

CO-II: Know about exponential, logarithmic, hyperbolic functions of a complex variable.

CO-III: learn and evaluate how to find Eigen-values, eigen-vectors of a matrix and characteristic equation of a matrix and diagonalization of matrices.

CO-IV : learn and evaluate rank of the matrix and use it to recognize consistent and inconsistent system of linear equations using row echelon form of the matrices.

INSTRUCTIONS FOR THE PAPER-SETTER /EXAMINER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having twelve short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 7 marks and Section C will be of 12 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Sections A and B and compulsory question of Section C.

SECTION:A

D'Moivre's theorem and its applications: primitive nth root of unity, Expansions of sinnθ , cosnθ , $\boldsymbol{sin^n\theta}$, $\boldsymbol{cos^n\theta}$ (n ∈N). The exponential, logarithmic, circular and hyperbolic functions

Relation between the roots and coefficients of a general polynomial in one variable, Transformation of equation, solutions of cubic equations using cardon's method, solutions of bi - quadratic equation using Descarte's method.

SECTION:B

Hermitian and skew- hermitian matrices, Elementary operations on matrices, linear independence and dependence of row and column vectors, row rank, column rank and rank of a matrix and their equivalence, Normal form of a matrix, Theorems on consistency of a system of linear equations (both homogeneous and non homogeneous). Eigen-values, eigen-vectors and characteristic equation of a matrix, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Diagonalization.

Books Recommended:

1. K.B. Datta : Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
2. S. R. Knight and H.S. Hall : Higher Algebra, H.M. Publications, 1994.
3. R.S. Verma and K.S. Shukla : Text Book on Trigonometry, Pothishala Pvt. Ltd., Allahabad.

4. Shanti Narayan and P.K. Mittal : A Text Book of Matrices, S. Chand & Co., NewDelhi, Revised Edition, 2007.
5. C.Prasad,Text book on Algebra and theory of equations, Pothishala Pvt. Ltd., Allahabad.

Semester-II

BMAT128 (A): GEOMETRY

Maximum Time: 3 Hrs. 6 Lectures of 40 minutes duration/week
Maximum Marks: 50 Marks Maximum Time: 3 Hrs.
External Marks: 40 Internal Assessment: 10
Pass Percentage: 35%

Course objective: The objective of the course is to help the students understand the properties of two dimensional and three dimensional geometric figures and their applications.

Course learning outcomes: On completion of course ,the student will be able to

CO-I: learn and evaluate concepts of parabola, ellipse and their applications.
CO-II: grasp concepts of solid geometry (sphere ,cone)
CO-III: learn and evaluate general equation of conic and identification of conics.
CO- IV: Able to learn joint equation of pair of straight lines and angle between them and Condition of parallelism and perpendicularity. .

INSTRUCTIONS FOR THE PAPER-SETTER /EXAMINER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having twelve short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 7 marks and Section C will be of 12 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Sections A and B and compulsory question of Section C.

SECTION: A

Transformation of axes in two dimensions: Shifting of origin, rotation of axes, invariants, identification of curves represented by second degree equation.

Pair of Straight Lines : Joint equation of pair of straight lines and angle between them, Condition of parallelism and perpendicularity, Joint equation of lines joining origin to the intersection of a line and a curve.

Parabola, ellipse: pole and polar , tangents, normals, chord of contact, pair of tangents from a point, equation of chord in terms of mid-point, diameter of conic, Conjugate diameters of ellipse

SECTION : B

Sphere: General equation of sphere, plane section of sphere, intersection of two spheres, sphere through a given circle, intersection of a straight line and a sphere, equation of tangent plane to sphere, condition of tangency, plane of contact, orthogonal spheres ,angle of intersection of two spheres ,length of tangent ,radical plane.

Cone: equation of cone whose vertex is at origin, equation of cone with a given vertex and a given conic as base, condition that a general equation of second degree represent a cone, equation of a tangent plane, condition of tangency of a plane and a cone ,reciprocal cone ,right circular cone.

Books Recommended:

1 . S. L. Loney : *The Elements of Coordinate Geometry,* Macmillan and Company, London, 2 nd Edition 2007.

2. P.K. Jain and Khalil Ahmad *: A Text Book of Analytical Geometry of Two Dimensions,* Wiley Eastern Ltd., 1999.

3. Gorakh Prasad and H.C. Gupta : *Text Book on Coordinate Geometry*, Pothishala Pvt. Ltd., Allahabad, 1955.
4. N.Saran and R.S. Gupta, *Analytical geometry of three dimensions,* Pothishala Pvt. Ltd,Allahabad,2017
5. R.J.T. Bell, *An elementary treatise on coordinate geometry of three dimensions*, Sagwan Press, 2015.

BMAT128 (B): DIFFERENTIAL EQUATION

Maximum Time: 3 Hrs. Maximum Time: 3 Hrs.
Maximum Marks: 50 Marks] Internal Assessment: 10
External Marks: 40 Pass Percentage: 35%

Course Objective: This course is intented to expose students to the basic ideas of differential equations and aquire skills to learn various methods to solve differential equations.
Course learning outcomes: On completion of course ,the student will be able to
CO-I: understand concepts of differential equations and partial differential equations.
CO-II: solve first order differential equation and exact differential equations.
CO-III: solve homogeneous and non-homogeneous linear differential equations with constant coefficients
CO- IV: solve higher order differential equations using method of variation of parameters.
CO-V: solve partial differential equation of first and higher degrees using various methods.

INSTRUCTIONS FOR THE PAPER-SETTER /EXAMINER
The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having twelve short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 7 marks and Section C will be of 12 marks.
INSTRUCTIONS FOR THE CANDIDATES
Candidates are required to attempt five questions in all selecting two questions from each of the Sections A and B and compulsory question of Section C.

SECTION: A
First order differential equations : Order and degree of a differential equation, Homogeneous differential equations, equations reducible to Homogenous differential equations , Exact differential equations, Linear differential equations and equations reducible to linear differential equations.
Higher order differential equations : Wronskian , Solution of Linear homogeneous and non-homogeneous differential equations of higher order with constant coefficients and with variable coefficients, Differential operator method, Method of Variation of Parameters, Linear non-homogeneous differential equations with variable coefficients

SECTION : B
Partial differential equations of the first order: lagrange's solutions, some special types of equations which can be solved easily by methods other than general method, charpit's general method of solution.

Partial differential equations of second and higher order: classifications of linear partial differential equations of second order ,Homogeneous and non-homogeneous equations with constant cofficients , partial differential equations reducible to equations with constant cofficients, Monge's method.

Books Recommended:

Zafar Ahsan: Differential Equations and Their Applications, Prentice-Hall of India Pvt. Ltd. New Delhi second edition
Richard Bronson(2004): Theory and problems of differential equations ,McGraw-Hill,(India)
Rao,K.S.(2010):Introduction to partial differential equations ,india :PHI
Rai Singania: Ordinary and partial differential equations ,S Chand and company ,New Delhi