3. Study of half wave rectifier using single diode and application of L and π section filters.
4. To study characteristics of a given transistor PNP/NPN (common emitter, common base and common collector configurtainos).
5. Determination of band gap using a junction diode.
6. Determination of power factor (cos θ) of a given coil using CRO.
7. Study of single stage transistor audio amplifier (variation of gain with frequency).
8. To determine η/m by Thomson's method.
9. Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO.
10. Measurement of inductance by Anderson's bridge.
11. Measurement of capacitance and dielectric constant of a liquid and gang condenser by de Sauty bridge.

बी.एस.सी, बी.एड-05/06/07 (G.B.) पार्ट - II

MATHEMATICS

Teaching : 3 Hours per Week per Theory Paper.
2 Hours per Week per Batch for Practical
(20 candidates in each batch)

Examination:

		Min.Pass Marks	Max. Marks
Scheme:	**Science – 54**		**150**
		Duration	**Max.Marks**
Paper – I	**Real Analysis and Metric Space**	**3 hrs.**	**40 (Science)**
Paper – II	**Differential Equations**	**3 hrs.**	**40 (Science)**
Paper – III	**Numerical Analysis and Vector Calculus**	**3 hrs.**	**40 (Science)**
Practical	**Numerical Methods**	**2 hrs.**	**30 (Science)**

Note:

1. Common paper will be set for both the Faculties of Social Science and Science. However. the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.

2. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.

3. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates. (20 candidates in each batch)

4. Each candidate has to pass in Theory and Practical examinations separately.

Raj | July 23/7/18

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Paper – I: Real Analysis and Metric [illegible]
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours **Max. Marks: 40 (Science)**

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Real numbers as complete ordered field. Limit point. Bolzano-Weierstrass theorem. Closed and Open sets. Union and Intersection of such sets. Concept of compactness. Heine-Borel theorem. Connected sets.
Real sequences- Limit and Convergence of a sequence. Monotonic sequences.

Unit 2: Cauchy's sequences. Subsequences. Cauchy's general principle of convergence. Properties of continuous functions on closed intervals. Properties of derivable functions. Darboux's and Rolle's theorem.

Unit 3: Notion of limit, continuity and differentiability for functions of two variables. Riemann integration – Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.

Unit 4: Functions of bounded variations. Sequence and series of functions – Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.

Unit 5: Metric space – Definition and examples. Open and Closed sets. Interior and Closure of a set, Limit point of a set.
Subspace of a metric space, Product space, Continuous mappings, Sequence in a metric space, Cauchy sequence.

Reference Books:

1. Shanti Narayan and M.D. Raisinghania. Elements of Real Analysis. S. Chand & Co., N.D., 2008.
2. S. Kumaresan. Topology of Metric Spaces. Narosa Publishing House. Second Edition 2011.
3. K.A. Ross, Elementary Analysis: The Theory of Calculus. Undergraduate Texts in Mathematics. Springer (SIE). Indian reprint, 2004.
4. R.G. Bartle D.R. Sherbert, Introduction to Real Analysis (3rd edition), John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
5. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition),2011.
6. G. F. Simmons, Introduction to Topology and Modern Analysis, Mcgraw-Hill, Edition 2004.
7. T.M.Apostol, Mathematical Analysis, Narosa Pub. House, N.D., 2000.
8. R.R.Goldberg, Real Analysis, Oxford & IBH Pub. Co., N.D. 1999.

Raj Jain 23/X/(Acad.)

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Paper – II: Differential Equations
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours **Max. Marks: 40 (Science)**

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form. Linear equations and equations reducible to linear form. *Exact differential equations and equations which can be made exact.*

Unit 2: First order but higher degree differential equations solvable for x,y and p. Clairaut's form and singular solutions with Extraneous Loci. Linear differential equations with constant coefficients. Complimentary function and Particular integral.

Unit 3: Homogeneous linear differential equations. Simultaneous differential equations. Exact linear differential equations of nth order. Existence and uniqueness theorem.

Unit 4 : Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.

Unit 5: Partial differential equations of the first order. Lagrange's linear equation. Charpit's general method of solution. Homogeneous and non-homogeneous linear partial differential equations with constant coefficients. Equations reducible to equations with constant coefficients.

Reference Books:

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co., 2003.
2. M.Ray, A Text Book on Differential Equations, Students and Friends Co., Agra, 1998.
3. E.A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.
4. R.S. Senger, Ordinary Differential Equations with Integration, Prayal Publ. 2000.
5. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.
6. Frank Ayres, Theory and Problems of Differential Equations, TMH, 2002.
7. I.N. Snedon, Elements of Partial Differential Equations, TMH, 2001.

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Paper – III: Numerical Analysis and Vector Calculus
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours **Max. Marks: 40 (Science)**

Note: (i) This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.
(ii) Non-Programmable Scientific Calculators are allowed.

Unit 1: Differences. Relation between differences and derivatives. Differences of a polynomial. Newton's formulae for forward and backward interpolation. Divided differences. Newton's divided difference. Lagrange's interpolation formula.

Unit 2: Central differences.Gauss's, Stirling's and Bessel's interpolation formulae. Numerical Differentiation. Derivatives from interpolation formulae. Numerical integration. Derivations of general quadrature formulas. Trapazoidal rule. Simpson's one-third. Simpson's three-eighth and Gauss's quadrature formulae.

Unit 3: Relation between the roots and coefficients of general polynomial equation in one variable, transformation of equations, Descarte's rule of signs, solution of cubic equations by Cardon's method, biquadratic equations by Ferari's method.
Numerical solution of Algebraic and Transcendental equations, Bisection method, Secant method, Regula-Falsi method, Iteration method, Newton- Raphson Method (derivation of formulae and rate of convergence only).

Unit 4: Gauss elimination and Iterative methods (Jacobi and Gauss Seidal) for solving system of linear algebraic equations, Partial Pivoting method, ill conditioned systems, Numerical solutions of ordinary differential equations of first order with initial condition using Picard's, Euler and modified Euler's method.

Unit 5: Scalar and Vector point functions. Differentiation and integration of vector point functions. Directional derivative. Differential operators. Gradient, Divergence and Curl. Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Reference Books:

1. H.C. Saxena, Calculus of Finite Differences and Numerical Analysis, S.Chand & Co., N.D., 1986.
2. Shanti Narayan and J.N. Kapur, A Text Book of Vector Calculus, S.Chand, 1966.
3. Murray R. Spiegel, Vector Analysis, McGraw-Hill, 1959.
4. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007.
5. C. F. Gerald and P. O. Wheatley, Applied Numerical Analysis, Pearson Educatioh, India,7th edition, 2008.
6. C.F. Gerald, P.O. Wheatley, Applied Numerical Analysis, Addison-Wesley, 1998

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Practical: Numerical Methods
Teaching: 2 Hours per Week per Batch

Examination: **Duration: 2 Hours**

Scheme	Science
Max.Marks	30
Min.Pass Marks	10

Distribution of Marks:
Two Practicals one from each group

10 Marks each	=	20 Marks (13 Marks each)	26
Practical Record	=	05 Marks	07
Viva-voce	=	05 Marks	07
Total Marks	=	30 Marks	40

Group A: Numerical integration using Trapezoidal and Simpson's rules.Numerical solution of Algebraic and Transcendental equations using
(i) Bisection method, (ii) Secant method (iii) Regula-Falsi method (iv) Iteration method. (v) Newton- Raphson Method.
Group B: Numerical Solution of system of linear equations by Gauss elimination, Jacobi and Guass-Seidel methods. Solution of linear differential equations of first order and first degree with initial and boundary condition using modified Euler's method. Runge-Kutta Fourth order method.

Note:

1. Problems will be solved by using Scientific Calculators (non-Programmable)
2. Candidates must know about all functions and operations of Scientific Calculator.
3. Each Candidate (Regular/Non-Collegiate) has to prepare his/her practical record.
4. Each Candidate has to pass in Practical and Theory examinations separately.

Raj | Jai | 23/10/18

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