"Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur (Autonomous)

DEPARTMENT OF MATHEMATICS

M.Sc. Part - I
Semester-I & II

SYLLABUS

Under Choice Based Credit System

to be implemented from Academic Year 2018-19

M.Sc. I (Sem -I and II) Mathematics
Course Structure
Semester I

Course code	Title o the course	Instructions Lectures /Week	Duration of term end exam	Marks Term end exam	Marks (Internal) Continuous Assessment	Credit
CP-1170A	Algebra	5	3 hours	90	30	5
CP-1171A	Advanced Calculus	**5**	3 hours	90	30	5
CP-1172A	Complex Analysis	**5**	3 hours	90	30	5
CP-1173A	Ordinary Differential Equation	**5**	3 hours	90	30	5
CP-1174A	Classical Mechanics	**5**	3 hours	90	30	5

Semester II

Course code	Title o the course	Instructions Lectures /Week	Duration of term end exam	Marks Term end exam	Marks (Internal) Continuous Assessment	Credit
CP-1175B	Linear Algebra	5	3 hours	90	30	5
CP-1176B	Measure and integration	**5**	3 hours	90	30	5
CP-1177B	General Topology	**5**	3 hours	90	30	5
CP-1178B	Partial Differential Equation	**5**	3 hours	90	30	5
CP-1179B	Numerical Analysis	**5**	3 hours	90	30	5

M.Sc. Mathematics Part – I CBCS
Semester - I Paper- I
Algebra (CP-1170A)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Check solvability of groups via Sylow's theorems.
CO2 Check irreducibility of polynomial over any field.
CO3 familiar with theory of modules.
CO4 apply the basic concepts of field theory, including field extensions and finite fields.

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Permutation Group, Group of symmetry, Dihedral Group, Commutator subgroups, Simple groups, simplicity of An (n > 5), normal and subnormal series, Jordan-Holder theorem, Solvable groups, Nilpotent groups, isomorphism theorems, Zassenhaus Lemma, Schreier refinementtheorem.	15	1
Module 2	Group action on a set, isometry subgroups, Burnside theorem, Direct product and semidirect product of groups , Syllow's theorems, p-subgroups, Group of order 2p and pq, Class equation and applications	15	1
Module 3	Ring of Polynomials, Factorization of polynomials over fields, irreducible polynomials, Eisenstein criterion, ideals in F[x], unique factorization domain, principal ideal domain, Gauss lemma, Euclidean Domain.	15	1
Module 4	Modules, sub-modules, quotient modules, homomorphism and isomorphism theorems, fundamental theorem for modules, Completely reducible modules, free modules	15	1
Module 5	Examples, Problems, assignments, seminars etc. based on units I to IV above.	15	1

Reference Books:

1) John Fraleigh, A first course in Abstract Algebra by (3rd edition), Narosa publishing house,New Delhi.
2) C. Musili, Rings and Modules, Narosa Publishing house.
3) Joseph A. Gallian, Contemporary Abstract Algebra, Narosa Publication, Fourth Edition, 1999.
4)Bhattacharya, Jain and Nagpal , "Basic Abstract Algebra" , 2nd edition, Narosa PublishingHouse, New Delhi.

M.Sc. Mathematics Part – I CBCS
Semester - I Paper- II
Advanced Calculus (CP-1171A)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Make use of Greens Theorem, Stokes Theorems for an arc rectification of curve.
CO2 Analyse convergence of sequences and series of functions.
CO3 Find the directional derivative of function of several variables.
CO4 Optimize function of several variables.

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Functions of Bounded Variation& Rectifiable Curves – Introduction, Properties of monotonic functions, functions of Bounded Variation(B.V.), Total Variation(T.V.), additive property of T.V., T.V. on [a, x] as function of x, function of B.V. expressed as the difference of increasing functions, continuous functions of B.V., curves & paths, rectifiable paths, line integral, Green's theorem, Stoke's theorem.	12	1
Module 2	The Riemann-Stieltje's (R.S.) Integral – Introduction, notation, definition, linear property, integration by parts, change of variable, reduction to Riemann integration, Step functions as integrator, reduction to finite sum, Euler's summation formula, additive & linearity property of upper & lower integrals, Riemann's condition, Comparison theorem, Integration of B.V., Necessary condition for existence of RS integrals, Sufficient condition for existence of R.S. integrals	12	1
Module 3	Sequences and series of functions - Pointwise convergence of sequences of functions, uniform convergence, Uniform convergence and continuity, Cauchy condition for uniform convergence, Uniform convergence and Riemann integration, Uniform convergence and differentiation, double sequence, uniform convergence and double sequences, mean convergence. Multiplication of series, Power series, multiplication of power series, substitution theorem, reciprocal of power series, Real power series, The Taylor series generated by function, Bernstein's theorem, Binomial series, Abel's limit theorem, Tauber's theorem.	12	1

Module 4	Multivariable differential Calculus: The Directional derivatives, directional derivatives and continuity, total derivative, total derivatives expressed in terms of partial derivatives, The matrix of linear function, Jacobin matrix, Chain rule, mean value theorem for differentiable functions, A sufficient condition for differentiability, sufficient condition for equality of mixed partial derivatives, Taylor's formula for functions from Rn to R1. The inverse function theorem (Statement only)	12	1
Module 5	Implicit Functions - The implicit function theorem (Statement only) and their applications.Extrema of real valued functions of one variable, Extrema of real valued functions of several variables.	12	1

Reference Books:

Basic Reading :-

1) T. M. Apostal, Mathematical Analysis, Second Edition, Narosa Publishing House.

M.Sc. Mathematics Part – I CBCS
Semester - I Paper- III
Complex Analysis (CP-1172A)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Know how to check given complex valued function is analytic or not.
CO2 Find power series expansion of an analytic function with radius of convergence.
CO3 Find zeros and singularities of complex valued functions.
CO4 Evaluate integral of complex valued functions along given curve.

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Power series, radius of convergence, analytic functions, zeros of an analytic function, Cauchy-Riemann equations, Harmonic functions, Mobius transformations, line integral.	12	1
Module 2	Power series representation of analytical function, zeros of an analytic function, Liouville's theorem, Fundamental theorem of algebra, Maximum modulus theorem, the index of closed curve, Cauchy's theorem and integral formula, Morera's theorem.	12	1
Module 3	Counting zero's, The open mapping theorem, Goursat's Theorem, Classification of singularities, Laurent series development, Casorati-weierstrass theorem, residues, residues theorem ,evaluationof real integrals.	12	1
Module 4	The argument principle , Rouche's theorem, the maximum principle, Schwarz's lemma and its applications to characterize conformal maps.	12	1
Module 5	Examples, Problems, assignments, seminars etc. based on units I to IV above.	12	1

Reference Books:

1) 1.John B. Conway, Functions of one complex variable. (Narosa Publishing house)
2) 2.Lar's V. Ahlfors : Complex Analysis (Mc Graw Hill).
3) 3.Ruel V. Churchill / James Ward Brown : Complex Variables and Applications (McGraw Hill).
4) 4.S. Ponnusamy, Herb Silverman, Complex variables with applications analysis,Birkhauser,2006
5) 5. S. Ponnusamy, Foundations of complex analysis, Narosa publishing House.

M.Sc. Mathematics Part – I CBCS
Semester - I
Ordinary Differential Equations (CP-1173A)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Find the linearly independent and hence general solutions of given differential equations.
CO2 Find series solutions of Bessel's and Legendre's differential equations.
CO3 Apply Picard's successive approximation method to find approximate solution of initial value problem.
CO4 Apply the Lipschitz condition of successive approximation.

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Linear Equations with constant coefficients: The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for the Wronskian, The non-homogeneous equations of order two, The homogeneous equations of order n.	15	1
Module 2	Initial value problems for the nth order equations, The non-homogeneous equation of nth order. Linear Equations with variable coefficients: Initial value problems for the homogeneous equations. Solutions of the homogeneous equations, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The non-homogenous equations	15	1
Module 3	Sturm Liouville theory, Homogeneous equations with analytic coefficients, The Legendre equations. Linear Equations with regular singular points: The Euler equations, Second order equations with regular singular points.	15	1
Module 4	The Bessel equation, Regular singular points at infinity, Existence and uniqueness of solutions: The method of successive approximations, The Lipschitz condition of the successive approximation. Convergence of the successive approximation. Existence and Uniqueness of solutions to systems, Existence and Uniqueness for linear systems, Equations of order n.	15	1

Reference Books:

1) Coddington E. A.: An introduction to ordinary differential equations. (1974)

Prentice Hall ofIndia Pvt.Ltd. New Delhi.
2) Birkoff G. and Rota G.G.: Ordinary Differential equations, John Willey and Sons
3) Simmons G.F. , Differential Equations with Applications and Historical note, McGraw Hill,Inc. New York. (1972)
4) Coddington E.A. and Levinson: Theory of ordinary differential equations McGrawHill, New York(1955)
5) Rainvills E.D.,Elementary differential equations, The Macmillan company, New York. (1964)

M.Sc. Mathematics Part – I CBCS
Semester - I
Classical Mechanics (CP-1174A)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Analyse motion of system of particles through Lagrangian & Hamiltonian principles.
CO2 Apply principle of variation of calculus for extremization of problem.
CO3 Study motion of rigid body.
CO4 Understand Lagrangian and Hamiltonian formulation of Classical Mechanics.

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Mechanics of a particle, Mechanics of a system of particles, conservation theorems, constraints, Generalized coordinates, D' Alembert's Principle, Lagrange's equations of motion, simpleapplications of Lagrangian formulation, Kinetic energy as a homogeneous function ofgeneralized velocities, Non-conservation of total energy due to the existence of non-conservativeforces. Cyclic co-ordinates and generalized momentum, conservation theorems.	15	1
Module 2	Functionals, basic lemma in calculus of variations, Euler-Lagrange's equations, first integrals of Euler- Lagrange's equations, the case of several dependent variables Undetermined end conditions, Geodesics in a plane and space, the minimum surface of revolution, the problem of Brachistochrone, Isoperimetric problems, problem of maximum enclosed area.Hamilton's Principle, Derivation of Hamilton's principle from D'Alembert's principle,Lagrange's equations of motion from Hamilton's principle. Lagrange's equations of motion for nonconservative systems (Method of Langrange's undetermined multipliers)	15	1
Module 3	Hamiltonian function, Hamilton's canonical equations of motion, Derivation of Hamilton's equations from variational principle, Physical significance of Hamiltonian, the principle of least action, cyclic co-ordinates and Routh's procedure. Orthogonal transformations, Properties of transformation matrix, infinitesimal rotations.	15	1
Module 4	The Kinematics of rigid body motion: The independent co-ordinates of a rigid body, the Eulerian angles, Euler's theorem on motion of rigid body,Angular momentum and kinetic energy of a	15	1

	rigid body with one point fixed,the inertia tensor and moment of inertia, Euler's equations of motion,Cayley- Klein parameters, Matrix of transformation in Cayley- Klein parameters,Relations between Eulerian angles and Cayley- Klein parameters..		
Module 5	Examples, Seminars, Group Discussion on above units, Oral examinations	15	1

Reference Books:

1) Goldstein, H. Classical Mechanics. (1980), Narosa Publishing House, New Delhi.
2) Weinstock: Calculus of Variations with Applications to Physics and Engineering (International Series in Pure and Applied Mathematics). (1952), Mc Graw Hill Book
3) Company, New York.
4) Whittaker, E. T. A treatise on the Analytical Dynamics of particles and rigid bodies. (1965),Cambridge University Press.
5) Rana, N.C. and Joag, P. S. Classical Mechanics. (1991) Tata McGraw Hill, New Delhi.
6) Bhatia, V. B. Classical Mechanics with Introduction to Non-linear Oscillation andChaos.(1997), Narosa publishing House..

M.Sc. Mathematics Part – I CBCS
Semester - II
Linear Algebra (CP-1175B)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Understand basic notions in linear algebra and use the results in developing advanced mathematics.

CO2 Study the properties of vector spaces, linear transformations, algebra of linear transformations and inner product spaces in detail.

CO3 Construct canonical forms and bilinear forms.

CO4 Apply knowledge of vector space, linear transformations, canonical forms and bilinear transformations

Unit	**Syllabus**	**Lectures/ Teaching Hours**	**Credits**
Module 1	Direct sum of a vector space, Dual Spaces, Annihilator of a subspace, Quotient Spaces, Algebra of Linear transformations.	15	1
Module 2	Adjoint of a linear transformation, Inner product spaces, Eigen values and eigenvectors of alinear transformation, Diagonalization, Invariant subspaces.	15	1
Module 3	Canonical forms, Similarity of linear transformations, Reduction to triangular forms, Nilpotent transformations, Primary decomposition theorem, Jordan blocks and Jordan forms, Invariants oflinear transformations.	15	1
Module 4	Hermitian, Self adjoint, Unitary and normal linear transformation, Symmetric bilinear forms,skew symmetric bilinear forms, Group preserving bilinear forms**.**	15	1
Module 5	Examples, Seminars, Group Discussion on above units, Oral examinations	15	1

Reference Books:

1) Herstein I. N. : Topics in Algebra, 2nd Edition, Willey eastern Limited

2) Hoffman, Kenneth and Kunze R: Linear Algebra, Prentice Hill of India Private Limited, 1984.

3) Rao A. R. and Bhimashankaran P., Linear Algebra, Hidustan Book Agency (200)

4) Singh Surjit, Linear Algebra, Vikas publishing House (1997)

M.Sc. Mathematics Part – I CBCS
Semester - II
Measure And Integration (CP-1176B)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Understand algebra of sets, open and closed sets of real number and outer measure and measurable sets

CO2 Understand the abstract measure theory and definition and main properties of the integral

CO3 Able to construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.

CO4 Able to use the concept of measure theory to solve the problems related to probability theory, stochastic calculus and functional analysis

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Open Sets, Closed Sets and Borel Sets, Lebesgue Outer Measure, The sigma algebra of Lebesgue Measurable Sets, Countable Additivity, Continuity and Borel-Cantelli Lemma, Non measurable set	15	1
Module 2	Sums, Product and Composition of Measurable Functions, Sequential Pointwise limits and Simple Approximation. Littlewood's Three Principles, Egoroff's Theorem and Lusin's Theorem,Lebesgue Integration of a Bounded Measurable Function, Lebesgue Integration of a Non- negative Measurable Function.	15	1
Module 3	The General Lebesgue Integral, Characterization of Riemann and Lebesgue Integrability, Differentiability of Monotone Functions, Lebesgue's Theorem, Functions of Bounded Variations:Jordan's Theorem.	15	1
Module 4	Absolutely Continuous Functions, Integrating Derivatives: Differentiating Indefinite Integrals, Normed Linear Spaces, Inequalities of Young, Holder and Minkowski, The Riesz-Fischer Theorem.	15	1
Module 5	Examples, Seminars, Group Discussion on above units, Oral examinations	15	1

Reference Books:

1) Royden H. L., Fitzpateick P.M., Real Analysis. (2009) 4th edition. Prentice Hall of India, New Delhi

2) G. deBarra. Measure Theory and Integration. (1981) Wiley Eastern Ltd.

3) Rana, I. K. An Introduction to Measure and Integration. (1997) Narosa Book Company.

4) Berberian, S. K. Measure and Integration. (1965) McMillan, New York.

M.Sc. Mathematics Part – I CBCS
Semester - II
General Topology (CP-1177B)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Find different topologies on a given set and study their properties.
CO2 Check continuity of functions through different topological approaches
CO3 The student is able to apply his or her knowledge of general topology to formulate and solve problems of a topological nature in mathematics and other fields where topological issues arise.
CO4 To acquaint students with homeomorphism and some topological properties like connectedness, compactness

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Topological spaces, Examples, Limit points, Closed sets and closure, Interior, exterior, Neighborhoods, Different ways of defining topologies , Bases, Subbases, Subspaces of topological space. Hereditary properties	15	1
Module 2	Connected Spaces, Components, Connected subspaces of real lines, Compact Spaces,One point compactification, Continuous Functions, Homeomorphisms, Topological properties.	15	1
Module 3	Separation axioms: To, T1, T2-spaces, First and second axioms spaces, Separable Spaces, Lindelof spaces, Regular and T3 -Spaces, Normal and T4-Spaces.	15	1
Module 4	Completely Regular and T3 1/2-Spaces , Completely Normal and T5 -Spaces , Product Spaces (ForTo, T1, T2, -compact, and connected spaces), Urysohn lemma and Urysohn metrization theorem.	15	1
Module 5	Examples, Seminars, Group Discussion on above units, Oral examinations	15	1

Reference Books:

1) Munkers J. R., Topology: A First Course, Prentice Hall of India Pvt. Ltd.

2) Simmons G. F., Introduction to Topology and Modern Analysis, Mc Graw Hill BookCompany, New Delhi, 1963.

3) Joshi K. D., General Topology.

4) Willard, Topology, Academic press.

M.Sc. Mathematics Part – I CBCS
Semester - II
Partial Differential Equations (CP-1178B)
Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Classify given second order partial differential equations.
CO2 Use different method to solve boundary value problem specially use wave equations, Heat equations.
CO3 Understand what are well-posed initial (and/or boundary) value problems for classical PDEs such as the wave equation, the Laplace equation and the heat (diffusion) equation
CO4 Technique of separation of variables to solve PDEs and analyze the behavior of solutions in terms of eigen function expansions

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Curves and surfaces, First order Partial Differential Equations, , classification of first order partial differential equations, classifications of Integrals, Linear equations of first order. Pfaffian differential equations, Criteria of Integrability of a Pfaffian differential equation. Compatible systems of first order partial differential equations.	15	1
Module 2	Charpits method, Jacobi method of solving partial differential equations, Cauchy Problem, Integral surfaces through a given curve for a linear partial differential equations, for a non-linear partial differential equations, Method of characteristics to find the integral surface of a quasi linear partial differential equations	15	1
Module 3	Second order Partial Differential Equations. Origin of Partial differential equation, wave equations, Heat equation. Classification of second order partial differential equation. Vibration of an infinite string (both ends are not fixed) Physical Meaning of the solution of the wave equation. Vibration of an semi infinite string, Vibration of a string of finite length, Method of separation of variables, Uniqueness of solution of wave equation. Heat conduction Problems with finite rod and infinite rod, Cauchy problems	15	1

Module 4	Families to equipotential surfaces, Laplace equation, Solution of Laplace equation, Laplace equation in polar form, Laplace equation in spherical polar coordinates. Kelvin's inversion theorem. Boundary Value Problems: Dirichlets problems and Neumann problems. maximum and minimum principles, Stability theorem	15	1
Module 5	Examples, Seminars, Group Discussion on above units, Oral examinations	15	1

Reference Books:

1)Amarnath T.: An elementary course in Partial differential equations,Narosa publication, 1987.
2)Sneddon I. N.,: Elements of Partial Differential Equations, McGraw Hill Int.
3)Frite John: Partial Differential Equations

M.Sc. Mathematics Part – I CBCS
Semester - II
Numerical Analysis (CP-1179B)

Theory: 60Hour **Credits -05**

Course Outcomes: After the completion of the course the student will be able to -

CO1 Solve linear and non-linear equations by various numerical methods
CO2 Find numerical integrations along with error computations.
CO3 Solve initial value problems by different numerical methods.
CO4 Find rate of convergence of various numerical methods

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	Iterative solutions of Transcendental & polynomial equations: Bisection method, Iteration methods based on First degree equation (Secant method, Regula Falsi method, Newton Raphson method), Rate of Convergence, Iteration methods, Birge –Vieta method, Bairstow method.	15	1
Module 2	linear System of algebraic equations and Eigenvalue problems: Iteration methods (Jacobi iteration method, Gauss seidel iteration method) convergence analysis, Matrix factorization methods (Doo little reduction, Crout reduction), Eigen values and eigenvectors, Gerschgorin theorem, Brauer theorem, Jacobi method for symmetric matrices, Householder's method for symmetric matrices, power method.	15	1
Module 3	Interpolation, differentiation and integration: Lagrange and Newton interpolation, Truncation error bounds, Newtons divided difference interpolation, finite difference operators, Hermites interpolation, Cubic spline interpolation, numerical differentiation, methods based on interpolation, numerical integration, Error analysis, methods based on interpolation Newtoncotes methods, Error estimates for trapezoidal and Simpson's rule.	15	1
Module 4	Numerical solution of ordinary differential equations: Euler's method, analysis of Euler's method, Backward Euler's method, order of Euler's method, Explicit Runge –Kutta method of order two and four, midpoint method, Taylor series method,convergence and	15	1

	stability of numerical methods, Truncation error, error analysis.		
Module 5	Examples, Seminars, Group Discussion on above units, Oral examinations	15	1

Reference Books:

1) Jain M. K.,. Iyengar S. R. K, Jain R. K., 'Numerical methods forscientific and Engineering Computation', New Age International Limited Publishers 1993. Additional Reading :-
2) Jain M. K., Numerical Mathematics, Numerical solutions of Differential Equations
3) Sastry S. S., 'Introductory methods of Numerical Analysis', Prentice Hall of India New Delhi.
4) Atkinson. K. E., An introduction to Numerical analysis.
5) Buchaman J. I., P.R. Turner, Numerical methods and analysis.

SCHEME OF MARKING (THEROY)

Sem.	CP	Marks	Evaluation	Answer Books	Standard of passing
I	CP1170 A TO CP1174 A	90	Semesterwise	As per Instruction	35% (36 marks)
II	CP1175B TO CP1179B	90	Semesterwise	As per Instruction	35% (36 marks)

SCHEME OF MARKING (CIE) Continuous Internal Evaluation

Sem.	CP	Marks	Evaluation	AnswerBooks	Standard of passing
I	CP 1170 ATO CP 1174 A	30	Concurrent	As per Instruction	35% (12 marks)
II	CP1175 ATO CP1179 A	30	Concurrent	As per Instruction	35% (12 marks)

***A separate passing is mandatory**

Nature of Question Paper

Instructions*: 1)** *Questions* ***No. 1 *is* ***compulsory****.*

2) Attempt any ***four*** *questions from que. no. 2 to que. no. 7.*

3) All questions carry equal marks.

4) Figures to right indicates full marks.

5) Use of log table/calculator is allowed.

Time: 3 hours **Total Marks: 90**

Q. 1. A) Choose correct alternative. (2 Marks each) **08**

i)

A) B) C) D)

ii)

A) B) C) D)

iii)

A) B) C) D)

iv)

A) B) C) D)

B) Fill in the blanks. (2 Marks each) **10**

Q.2. A) **18**

B)

C)

OR

A) **18**

B)

Q.3. A) **18**

B)

C)

OR

A) **18**

B)

Q.4 *A)* ***18***

B)

C)

OR

A) ***18***

B)

Q.5. *A)* ***18***

B)

C)

OR

A) ***18***

B)

Q.6. *A)* ***18***

B)

C)

OR

A) ***18***

B)

Q.7. *A)* ***18***

B)

C)

OR

A) ***18***

B)

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REMARK:

Note that the distribution of marks for A, B, C or A, B (Q.N.2 to Q.N.-7)may vary according to the nature of question.