

DESIGN OF QUESTION PAPER

Subject : MATHEMATICS
Class : XI
Full Mark : 80
Time : 3 Hours

I	WEIGHTAGE TO OBJECTIVES:					
	Objectives			Marks	Percentage	
	Knowledge (K)			12	15	
	Understanding (U)			40	51	
	Application (A)			24	30	
	Skill (S)			04	04	
	Total:			80	100	
II	WEIGHTAGE TO FORM OF QUESTIONS:					
	Form of Questions		No. of Question	Time (in minutes)	Marks	Percentage
	Essay/Long Answer: (E/LA)		6	67	30	37
	Short Answer (SA-I)		3	27	12	15
	Short Answer (SA-II)		4	27	12	15
	Short Answer (SA-III)		5	23	10	13
	Very Short Answer(VSA)		6	13	6	7
	MCQ		10	23	10	13
	Total:		34	180	80	100
III	WEIGHTAGE TO CONTENT:					
	UNIT	CONTENTS			Marks	Percentage
	I	1.1	Sets, Relations and Functions		10	13
		1.2	Trigonometric functions		13	17
	II	2.1	Complex Numbers and Linear Inequalities		8	10
		2.2	Permutations & Combinations and Binomial Theorem		10	13
		2.3	Sequence and Series		7	8
	III	3.1	Straight lines		6	7
		3.2	Circle, Conic Section and Introduction to Three dimensional Geometry		6	7
	IV	4.1	Limits and Derivatives		8	10
	V	5.1	Statistics and Probability		12	15
	Total:		80			100
IV	SCHEME OF SECTIONS : NIL					
V	SCHEME OF OPTIONS : Internal option in one SA-I (case study question), two in SA-II, one in SA-III and three in E/LA					
VI	DIFFICULTY LEVEL : Difficult :30% of the total marks Average :50% of the total marks Easy :20% of the total marks					

Special Instruction: 1) Two questions of MCQ will be Assertion-Reason type question.
2) First option will be (a) & second option will be (b) in the internal option

Abbreviation : K(Knowledge),U(Understanding),C(Comprehension), Exp.(Expression), Skill(S), E(Essay Type), SA (Short Answer Type), VSA (Very Short Answer Type), MCQ(Multiple Choice Question)

INTERNAL ASSESSMENT	20 MARKS
Periodic Tests (Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities/Project Works	10 Marks

Conduct of Periodic Tests:

Periodic Test is a Pen and Paper assessment which is to be conducted by the respective subject teacher. The format of periodic test must have questions items with a balance mix, such as, very short answer (VSA), short answer (SA) and long answer (LA) to effectively assess the knowledge, understanding, application, skills, analysis, evaluation and synthesis. Depending on the nature of subject, the subject teacher will have the liberty of incorporating any other types of questions too. The modalities of the PT are as follows:

- a) Mode: The periodic test is to be taken in the form of pen-paper test.
- b) Schedule: In the entire Academic Year, three Periodic Tests in each subject may be conducted as follows:

Test	Pre-Mid-Term (PT-I)	Mid-Term (PT-II)	Post Mid-Term (PT- III)
Tentative Month			

This is only a suggestive schedule and schools may conduct periodic tests as per their convenience.

- c) Average of Marks: Once schools complete the conduct of all the three periodic tests, they will convert the weightage of each of the three tests into ten marks each for identifying best two tests. The best two will be taken into consideration and the average of the two shall be taken as the final marks for PT.
- d) The school will ensure simple documentation to keep a record of performance

Assessment of Activity Work:

Throughout the year any 10 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class (XI or XII) which is available on the link: <http://www.ncert.nic.in/exemplar/labmanuals.html> a record of the same may be kept by the student. An year end test on the activity may be conducted

The weightage are as under:

- The activities performed by the student throughout the year and record keeping: 5 marks
- Assessment of the activity performed during the year end test: 3 marks
- Viva-voce: 2 marks

SUGGESTIVE TOPICS FOR PROJECT

CLASS-XI MATHEMATICS

S.No.	Content
Unit-I: Sets and Functions	
1.	Sets
	Practical problems on Union and Intersection of two sets.
2.	Relations and Functions
	Composition of Functions
3.	Trigonometric Functions
	General solution of trigonometric equations of the type $\sin y = \sin \alpha$, $\cos y = \cos \alpha$ and $\tan y = \tan \alpha$.
Unit-II: Algebra	
1.	Principle of Mathematical Induction
	Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.
2.	(Complex Numbers and) Quadratic Equations
	Polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system, cube roots of unity
3.	Linear Inequalities
	Graphical solution of linear inequalities in two variables. Graphical method of finding a solution of system of linear inequalities in two variables.
4.	Binomial Theorem
	General and middle term in binomial expansion. Properties of binomial coefficients
5.	Sequence and Series
	Formulae for the following special sums $\sum_{k=1}^n k, \sum_{k=1}^n k^2, \sum_{k=1}^n k^3$
6	Idea of Logarithm, Anti-Logarithm and their applications
Unit-III: Coordinate Geometry	
1.	Straight Lines
	Normal form. General equation of a line.
2.	Introduction to Three-dimensional Geometry
	Section formula.
Unit-IV: Calculus	
1.	Limits and Derivatives
	Derivatives of composite functions (Chain rule).
Unit-V Statistics and Probability	
1.	Probability
	Random experiments; outcomes, sample space (set representation).

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Total:		34	180	80	100	
III	WEIGHTAGE TO CONTENT:					
	UNIT	CONTENTS			Marks	Percentage
	I	1.1	Relations and Functions		4	5
		1.2	Inverse Trigonometric Functions		4	5
	II	2.1	Matrices		5	6
		2.2	Determinants		5	6
	III	3.1	Continuity and Differentiability		8	10
		3.2	Applications of Derivatives		8	10
		3.3	Integrals		10	12
		3.4	Applications of Integral		3	4
		3.5	Differential Equations		6	8
	IV	4.1	Vectors		7	9
		4.2	Three - dimensional Geometry		7	9
	V	5.1	Linear Programming		5	6
VI	6.1	Probability		8	10	
Total:			80	100		
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SUGGESTIVE TOPICS FOR PROJECT

MATHEMATICS

CLASS XII

1.	RELATIONS AND FUNCTIONS:
	Congruent modules
	Composite function and inverse functions
2.	INVERSE TRIGONOMETRIC FUNCTION:
	(i) $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}, \tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}, \sec^{-1} x + \operatorname{cosec}^{-1} x = \frac{\pi}{2}$
	(ii) $\sin^{-1} x \pm \sin^{-1} y = \sin^{-1}(x\sqrt{1-y^2} \pm y\sqrt{1-x^2})$
	(iii) $\cos^{-1} x \pm \cos^{-1} y = \cos^{-1}(xy \mp \sqrt{1-x^2}\sqrt{1-y^2})$
	(iv) $\tan^{-1} x \pm \tan^{-1} y = \tan^{-1}\left(\frac{x \pm y}{1 \mp xy}\right)$
3	MATRICES:
	Questions based on word problems.
4	DETERMINANT:
	Properties of determinant and Cramer's Rule etc.
5	CONTINUITY AND DIFFERENTIABILITY
	Rolle's Theorem, Langrange's Mean Value Theorem
6	APPLICATIONS OF DERIVATIVES:
	Slope of tangent and normal to a curve, Equations of tangent and normal
7	INTEGRALS:
	Integration as limit of sum with diagram
8	APPLICATIONS OF INTEGRALS :
	Finding the area under simple curves $y=\sin x$, $y=\cos x$ and between two circles, two parabolas, circle and parabola, Area of triangle with given vertices, etc.
9	DIFFERENTIAL EQUATIONS :
	Formation of Differential Equations
10	VECTORS:
	Vector application in derivation of trigonometric formulae like - $\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y, \cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$ $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}, \quad a \cos B + b \cos A = c, \quad \text{etc.}$
11	THREE-DIMENSIONAL GEOMETRY :
	Conditions of perpendicularity and parallelism of two straight lines, Shortest distance between parallel lines
12	L.P.P.:
	Formation of L.P.P.
13	PROBABILITY:
	Random variables and probability distribution of random variable