પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગત મેથેમેટિક્સ વિષય સેમેસ્ટર-૧નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજુરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન,૨૦૨૩ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.

નોંધ: તા ૦૩.૦૧.૨૦૨૪નાં પરિપત્રનં: ૪૨/૨૦૨૪માં મેથેમેટિક્સનાં અભ્યાસક્રમમાં ફેરફાર કરવામાં આવેલ છે.

Bhakta Kavi Narsinh Mehta University Junagadh

18/6/2025

ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૨૮૬/૨૦૨૫
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,
સરકારી પોલીટેકનિક કેમ્પસ,
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,
ખડીયા, જૂનાગઢ-૩૬૨૨૬૩
તા.૧૮.૦૬.૨૦૨૫

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/ કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જુનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઇ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)

પ્રો. ડૉ. નાગ્રેચા
ચેરમેન,
BOS (Mathematics)
જી.કે. જોન. ચેમ. યુ.,
જૂનાગઢ.
તા. 11/07/2025

પ્રતિશ્રી,
એકેડેમીક ઓફિસરશ્રી,
જી.કે. જોન. ચેમ. યુ.,
જૂનાગઢ.

વિષય: રીપીટર્સ વિદ્યાર્થીઓ માટે NEP Syllabus બંધો.

માનનીયશ્રી,

જય ભારત સાથે જણાવવાનું કે BOS (Mathematics) દ્વારા NEP-2020 અન્વયેના Sem-1 થી 4 ના અભ્યાસક્રમો રીવાઈઝડ કરવામાં આવેલ છે. રીપીટર્સ (ATKT) વાળા લાગુ પડતા વિદ્યાર્થીઓએ નવો અભ્યાસ કરેલ NEP-2020 અન્વયેનો જુનો અભ્યાસક્રમ પ્રમાણે પરીક્ષા આપવાની રહેશે.

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

JUNAGADH

BOARD OF STUDIES

FACULTY OF SCIENCE

SYLLABUS FOR MATHEMATICS (HONOURS)

PROGRAMME (SEMESTER- I)

EFFECTIVE FROM JUNE, 2023

• Programme:	**B.Sc. (Honours)**
• Semester:	**1**
• Subject:	**Mathematics**
• Course code:	**DSC – 101 (Major Course – 1)**
• Title of the course	**Matrices and Coordinate Geometry (including practicals)**

Evaluation of 100 Marks (4 Credit Paper)

Continuous and Comprehensive Evaluation (**CCE**)-Formative- **50 Marks**		Semester End Evaluation (**SEE**)-Summative-**50 Marks**
Theory (25 Marks) 1. Written Test 15 Marks 2. Assignment 05 Marks 3. Attendance 05 Marks	**Practicals (25 Marks)** 1. Performance 15 Marks 2. Viva-voce 10 Marks	1. Writing and Memory Skill Test
Total 25 Marks	**Total 25 Marks**	**Total 50 Marks**

• Credit of the course and teaching hours per week	Course credit – 4 **Teaching hours:** 3 Hours/Week (Theory) + 2 Hours /Batch/Week (Practicals)

DSC – 101 (Major Course – 1)
Matrices and Coordinate Geometry

Course Learning Outcome:

- Student will recollect certain basic matrices.
- Student will be able to obtain inverse of matrix using different methods.
- Student will be able to understand the concept of rank of matrix and will be using it in problem solving.
- Students will have learned the Cayley Hamilton theorem and will be using it to obtain inverse of a square matrix.
- Student will be able to find eigen values and eigen vectors of a square matrix.
- Student will be well equipped to solve a system of simultaneous linear equations several variables.
- Students will have learned about relationship among different systems of point representation like Cartesian, polar, spherical, cylindrical systems.
- Students will have learned the equation of basic geometric structures in polar form.

UNIT 1: Concept of matrix [6 hours]

Some special matrices, adjoint of a matrix, inverse of a matrix and its existence & properties; determinant of a matrix, its properties and applications; symmetric matrix, skew symmetric matrix, Hermitian matrix and skew Hermitian matrix.

UNIT 2: Rank of matrix [10 hours]

Elementary row and column operations on a matrix, row and column vectors, linear independence of row(column) matrices, rank of a matrix, row and column rank of a matrix, equivalence of row and column ranks.

UNIT 3: Eigen values and eigen vectors of matrix [15 hours]

Characteristic equation of a matrix, eigen values and eigen vectors of a matrix, Cayley-Hamilton theorem & matrix inversion by using it; Application of matrix to solve a system of simultaneous linear (homogeneous and non-homogeneous both) equations, theorems on consistency of a system of simultaneous linear equations.

UNIT 4: Coordinate systems [14 hours]

Cartesian, polar, cylindrical and spherical coordinate system, conversion of coordinates of a point from cartesian to polar and vice-versa, conversion of coordinates of a point from cartesian to cylindrical and vice-versa, conversion of coordinates of a point from cartesian to spherical and vice-versa, distance between two points in polar coordinate system, area of triangle in polar coordinates, polar equation of line, polar equation of circle, polar equation of conics with general form, Pedal equation.

Mathematics Practicals

Practical No.	Title
1.	(A) Draw the graph of parabola, $y^2 = 4ax; a \in \mathbb{R}$. (B) Draw the graph of ellipse, $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1; a, b \in \mathbb{R}$. (C) Draw the graph of hyperbola, $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1; a, b \in \mathbb{R}$.
2.	(A) Draw the graph of cycloid whose parametric equations are $x = r(t - sint);\ y = r(1 - cost),\ t \in \mathbb{R}$. (B) Draw the graph of cardioid whose polar equation is given by $r(\theta) = a(1 - \cos(\theta));\ a = 4$.
3.	To obtain inverse of a matrix using adjoint.
4.	To obtain inverse of a matrix using Cayley- Hamilton theorem.
5.	To obtain inverse of a matrix using Gauss-Elimination Method.
6.	To obtain inverse of a matrix using Gauss-Jordan Method.
7.	To solve the system of simultaneous linear algebraic equations using Gauss Elimination Method. (System of equations involving at least four variables).
8.	To solve the given system of simultaneous linear algebraic equations using Gauss-Jordan Method. (System of equations involving at least four variables).
9.	To obtain rank of matrix.
10.	To obtain eigen values and eigen vectors of matrix.

Reference Books:

1. University Algebra -N.S. Gopalakrishnan, New Age International(P) Limited,2015.
2. Matrices – A. R. Vasistha, Krishna Prakashan Mandir, Meerut 2014.
3. Elements of co-ordinate geometry by S. L. Loney, Mac-Millan & Co.
4. An elementary treaty on co-ordinate geometry of three dimensions by R. J. T. Bell, Mac-Millan & Co.
5. A textbook of analytical geometry of three dimensions by P. K. Jain & Khalid Ahmad
6. A textbook on matrices by Shantinarayan
7. Analytical Solid Geometry by Shantinarayan & P. K. Mittal, S.Chand & Co.
8. Solid Geometry, Golden series Krishna Prakashan, Meerut.

<table>
<tr><td>• Programme:</td><td>B.Sc. (Honours)</td></tr>
<tr><td>• Semester:</td><td>1</td></tr>
<tr><td>• Subject:</td><td>Mathematics</td></tr>
<tr><td>• Course code:</td><td>DSC – 102 (Major Course – 2)</td></tr>
<tr><td>• Title of the course</td><td>Calculus and Solid Geometry (including practicals)</td></tr>
<tr><td colspan="2">Evaluation of 100 Marks (4 Credit Paper)
<table>
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<tr><td>Total 25 Marks</td><td>Total 25 Marks</td><td>Total 50 Marks</td></tr>
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<u>Teaching hours:</u>
3 Hours/Week (Theory) +
2 Hours /Batch/Week (Practicals)</td></tr>
</table>

DSC – 102 (Major Course – 2)

Calculus and Solid Geometry

Course Learning Outcome:

- Student will be able to think geometrically to develop proofs of mean value theorems.
- Student will be able learn the applications of mean value theorems.
- Student will understand various indeterminate forms and hence solve limit examples of such types.
- Student will learn the famous L`Hospital's theorem and use it in problem solving.
- Student will further learn two important geometric shapes namely sphere and cylinder in detail.
- Student will be able to visualize intersection of plane and sphere.
- Student will be able to visualize intersection of two spheres.
- Student will be able to visualize the concept of tangent plane to a sphere and also find equation of such a plane and hence derive condition for tangency of a plane to sphere.
- Student will be able to visualize the construction of cylinder.
- Student will learn the equation of a right circular cylinder with given radius r.

UNIT 1: **[14 hours]**

Mean Value Theorems:

Rolle's, Lagrange's and Cauchy's mean value theorems and problems related to it.

Taylor's theorem and expansions:

Taylor's theorem (Without proof), Maclaurin'stheorem (Without proof), Taylor's and Maclaurin's infinite series expansions, expansions of ***exp(x),*** $\sin x$ **,** $\cos x$**,** $(1+x)^n$**,** $\log(1+x)$ under proper conditions.

UNIT 2: Indeterminate Forms **[8 hours]**

L`Hospital`s rules for various indeterminate forms with proof, various indeterminate forms like $\frac{0}{0}$form, $\frac{\infty}{\infty}$ form, 0^0 form, ∞^0 form, $0\cdot\infty$ form, $\infty-\infty$ form.

UNIT 3: Sphere **[15 hours]**

Equation of a sphere in different forms like standard form, central form, vector form, general equation of sphere with center (α, β, γ) and radius *a*. Plane section of a sphere, intersection of two spheres, equation of sphere having a given diameteral extremities, sphere through a given circle, intersection of a sphere and a line, power of a point, equation of a tangent plane and normal to a sphere, condition for the plane $lx + my + nz = p$ to touch the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$.

UNIT 4: Cylinder **[8 hours]**

Definition of a cylinder, equation of a cylinder with generator parallel to $\frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ and guiding curve $ax^2+2hxy+by^2+2gx+2fy+c=0\ ;\ z=0$.

Equation of right circular cylinder having axis $\frac{x-\alpha}{l}=\frac{y-\beta}{m}=\frac{z-\gamma}{n}$ and radius r.

Mathematics Practicals

Practical No.	Title
1.	Draw the graphs of $y=\sinh x$, $y=\cosh x$ and $y=\tanh x$.
2.	Draw the graphs of $y=\operatorname{cosech} x$, $y=\operatorname{sech} x$ and $y=\coth x$.
3.	Draw the graphs of $y=\sinh^{-1} x$, $y=\cosh^{-1} x$ and $y=\tanh^{-1} x$.
4.	Draw the graphs of $y=\operatorname{cosech}^{-1} x$, $y=\operatorname{sech}^{-1} x$ and $y=\coth^{-1} x$.
5.	Successive differentiation: Find n^{th} derivative of $y=\frac{x}{x^2+a^2}$ and other similar type of examples.
6.	Successive differentiation: Show that the n^{th} derivative of $y=\tan^{-1}x$ is $y_n=(-1)^{n-1}.(n-1)![\sin\{n(\frac{\pi}{2}-y)\}\sin^n(\frac{\pi}{2}-y)]$ and other similar type of examples.
7.	Successive differentiation: If $y=\sin mx+\cos mx$, then show that $y_n=m^n\sqrt{1+(-1)^n\sin 2mx}$ and other similar type of examples.
8.	Reduction formulae: Evaluate problems of type $\int\sin^6 x dx$, $\int\cos^7 x dx$ and $\int\sin^4 x\cos^4 x dx$ with integration suitable limits.
9.	Reduction formulae: Evaluate $\int_0^{2a} x^2\sqrt{2ax-x^2}dx$, $\int_0^{\infty}\frac{x^2}{(1+x^2)^{9/2}}dx$ and $\int_0^a x^4(a^2-x^2)^{3/2}dx$ and other similar problems.
10.	Evaluate $\int_0^{\infty}\frac{1}{(1+x^2)^3}dx$, $\int_0^2\frac{x^4}{\sqrt{4-x^2}}dx$, $\int_0^{\infty}\frac{1}{(a^2+x^2)^4}dx$.

Reference Books:

1. Differential Calculus by Shanti Narayan.
2. Differential Calculus by Gorakh Prasad.
3. Elements of co-ordinate geometry by S. L. Loney, Mac-Millan & Co.
4. A text book of analytical geometry of three dimensions by P. K. Jain & Khalid Ahmad.
5. Analytical Solid Geometry by Shanti Narayan & P. K. Mittal, S.Chand.
6. Solid Geometry, Golden Series Krishna Prakashan , Meerut.

• Programme:	**B.Sc. (Honours)**
• Semester:	**1**
• Subject:	**Mathematics**
• Course code:	**DSM – 101 (Minor Course - 1)**
• Title of the course	**Matrices and Coordinate Geometry (Including Practicals)**

Evaluation of 100 Marks (4 Credit Paper)

Continuous and Comprehensive Evaluation(**CCE**)-Formative- **50 Marks**		Semester End Evaluation(**SEE**)-Summative- **50 Marks**
Theory (25 Marks) 1. Written Test 15 Marks 2. Assignment 05 Marks 3. Attendance 05 Marks	**Practicals (25 Marks)** 1. Performance 15 Marks 2. Viva-voce 10 Marks	1. Writing and Memory Skill Test
Total 25 Marks	**Total 25 Marks**	**Total 50 Marks**

• Credit of the course and teaching hours per week	Course credit – 4 **Teaching hours :** 3 Hours/Week (Theory) + 2 Hours /Batch/Week (Practicals)

DSM – 101 (Minor Course - 1)

Matrices and Coordinate Geometry

Course Learning Outcome:

- Student will recollect certain basic matrices.
- Student will be able to obtain inverse of matrix using different methods.
- Student will be able to understand the concept of rank of matrix and will be using it in problem solving.
- Students will have learned the Cayley Hamilton theorem and will be using it to obtain inverse of a square matrix.
- Student will be able to find eigen values and eigen vectors of a square matrix.
- Student will be well equipped to solve a system of simultaneous linear equations several variables.
- Students will have learned about relationship among different systems of point representation like Cartesian, polar, spherical, cylindrical systems.
- Students will have learned the equation of basic geometric structures in polar form.

UNIT 1: Concept of matrix [6 hours]

Some special matrices, adjoint of a matrix, inverse of a matrix and its existence & properties;

determinant of a matrix, its properties and applications; symmetric matrix, skew symmetric matrix, Hermitian matrix and skew Hermitian matrix.

UNIT 2: Rank of matrix [10 hours]

Elementary row and column operations on a matrix, row and column vectors, linear independence of row(column) matrices, rank of a matrix, row and column rank of a matrix, equivalence of row and column ranks.

UNIT 3: Eigen values and eigen vectors of matrix [15 hours]

Characteristic equation of a matrix, eigen values and eigen vectors of a matrix, Cayley-Hamilton theorem & matrix inversion by using it; Application of matrix to solve a system of simultaneous linear (homogeneous and non-homogeneous both) equations, theorems on consistency of a system of simultaneous linear equations.

UNIT 4: Coordinate systems [14 hours]

Cartesian, polar, cylindrical and spherical coordinate system, conversion of coordinates of a point from cartesian to polar and vice-versa, conversion of coordinates of a point from cartesian to cylindrical and vice-versa, conversion of coordinates of a point from cartesian to spherical and vice-versa, distance between two points in polar coordinate system, area of triangle in polar coordinates, polar equation of line, polar equation of circle, polar equation of conics with general form, Pedal equation.

Mathematics Practicals

Practical No.	Title
1.	(A) Draw the graph of parabola, $y^2 = 4ax; a \in \mathbb{R}$. (B) Draw the graph of ellipse, $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1; a, b \in \mathbb{R}$. (C) Draw the graph of hyperbola, $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1; a, b \in \mathbb{R}$.
2.	(A) Draw the graph of cycloid whose parametric equations are $x = r(t - sint);\ y = r(1 - cost),\ t \in \mathbb{R}$. (B) Draw the graph of cardioid whose polar equation is given by $r(\theta) = a(1 - \cos(\theta));\ a = 4$.
3.	To obtain inverse of a matrix using adjoint.
4.	To obtain inverse of a matrix using Cayley- Hamilton theorem.
5.	To obtain inverse of a matrix using Gauss-Elimination Method.
6.	To obtain inverse of a matrix using Gauss-Jordan Method.
7.	To solve the system of simultaneous linear algebraic equations using Gauss Elimination Method. (System of equations involving at least four variables).
8.	To solve the given system of simultaneous linear algebraic equations using Gauss-Jordan Method. (System of equations involving at least four variables).
9.	To obtain rank of matrix.
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Reference Books:

1. University Algebra - N.S. Gopalakrishnan, New Age International(P) Limited, 2015.
2. Matrices – A. R. Vasistha, Krishna Prakashan Mandir, Meerut 2014.
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8. Solid Geometry, Golden series Krishna Prakashan, Meerut.

• Programme:	**B.Sc. (Honours)**
• Semester:	**1**
• Subject:	**Mathematics**
• Course code:	**MDC – 101 (Multidisciplinary Course – 1)**
• Title of the course	**Matrices and Coordinate Geometry (Including Practicals)**

Evaluation of 100 Marks (4 Credit Paper)

Continuous and Comprehensive Evaluation (**CCE**)-Formative-**50 Marks**		Semester End Evaluation (**SEE**)-Summative-**50 Marks**
Theory (25 Marks) 1. Written Test 15 Marks 2. Assignment 05 Marks 3. Attendance 05 Marks	**Practicals (25 Marks)** 1. Performance 15 Marks 2. Viva-voce 10 Marks	1. Writing and Memory Skill Test
Total 25 Marks	**Total 25 Marks**	**Total 50 Marks**

• Credit of the course and teaching hours per week	Course credit – 4 **Teaching hours:** 3 Hours/Week (Theory) + 2 Hours /Batch/Week (Practicals)

MDC – 101 (Multidisciplinary Course - 1)

Matrices and Coordinate Geometry

Course Learning Outcome:

- Student will recollect certain basic matrices.
- Student will be able to obtain inverse of matrix using different methods.
- Student will be able to understand the concept of rank of matrix and will be using it in problem solving.
- Students will have learned the Cayley Hamilton theorem and will be using it to obtain inverse of a square matrix.
- Student will be able to find eigen values and eigen vectors of a square matrix.
- Student will be well equipped to solve a system of simultaneous linear equations several variables.
- Students will have learned about relationship among different systems of point representation like Cartesian, polar, spherical, cylindrical systems.
- Students will have learned the equation of basic geometric structures in polar form.

UNIT 1: Concept of matrix [6 hours]

Some special matrices, adjoint of a matrix, inverse of a matrix and its existence & properties;

determinant of a matrix, its properties and applications; symmetric matrix, skew symmetric matrix, Hermitian matrix and skew Hermitian matrix.

UNIT 2: Rank of matrix [10 hours]

Elementary row and column operations on a matrix, row and column vectors, linear independence of row(column) matrices, rank of a matrix, row and column rank of a matrix, equivalence of row and column ranks.

UNIT 3: Eigen values and eigen vectors of matrix [15 hours]

Characteristic equation of a matrix, eigen values and eigen vectors of a matrix, Cayley-Hamilton theorem & matrix inversion by using it; Application of matrix to solve a system of simultaneous linear (homogeneous and non-homogeneous both) equations, theorems on consistency of a system of simultaneous linear equations.

UNIT 4: Coordinate systems [14 hours]

Cartesian, polar, cylindrical and spherical coordinate system, conversion of coordinates of a point from cartesian to polar and vice-versa, conversion of coordinates of a point from cartesian to cylindrical and vice-versa, conversion of coordinates of a point from cartesian to spherical and vice-versa, distance between two points in polar coordinate system, area of triangle in polar coordinates, polar equation of line, polar equation of circle, polar equation of conics with general form, Pedal equation.

Mathematics Practicals

Practical No.	Title
1.	(A) Draw the graph of parabola, $y^2 = 4ax; a \in \mathbb{R}$. (B) Draw the graph of ellipse, $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1; a, b \in \mathbb{R}$. (C) Draw the graph of hyperbola, $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1; a, b \in \mathbb{R}$.
2.	(A) Draw the graph of cycloid whose parametric equations are $x = r(t - sint);\ y = r(1 - cost),\ t \in \mathbb{R}$. (B) Draw the graph of cardioid whose polar equation is given by $r(\theta) = a(1 - \cos(\theta));\ a = 4$.
3.	To obtain inverse of a matrix using adjoint.
4.	To obtain inverse of a matrix using Cayley- Hamilton theorem.
5.	To obtain inverse of a matrix using Gauss-Elimination Method.
6.	To obtain inverse of a matrix using Gauss-Jordan Method.
7.	To solve the system of simultaneous linear algebraic equations using Gauss Elimination Method. (System of equations involving at least four variables).
8.	To solve the given system of simultaneous linear algebraic equations using Gauss-Jordan Method. (System of equations involving at least four variables).
9.	To obtain rank of matrix.
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Reference Books:

1. University Algebra -N.S. Gopalakrishnan, New Age International(P) Limited, 2015.
2. Matrices – A. R. Vasistha, Krishna Prakashan Mandir, Meerut 2014.
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5. A textbook of analytical geometry of three dimensions by P. K. Jain & Khalid Ahmad
6. A textbook on matrices by Shantinarayan
7. Analytical Solid Geometry by Shantinarayan & P. K. Mittal, S.Chand & Co.
8. Solid Geometry, Golden series Krishna Prakashan, Meerut.

Format of Question Papers for External Theory Examination
(Semester End Evaluation (**SEE**)-Summative-**50 Marks)**
for
Major Course-1 & 2, Minor Course-1 and Multidiscipline Course-1

(*Effective from Academic Year 2025 – 26 onwards*)

- There will be total FIVE questions.
- One question from every unit comprising of 10 marks each.
  Remaining one question will be asked from all four units of 10 marks

Question No. **1 to 4** (A) Answer any ONE out of TWO. 05 Marks (B) Answer any ONE out of TWO. 05 Marks **Total of each question from 1 to 4 10 MARKS**	
Question No. **5** (A) Answer any ONE out of TWO 05 Marks (one question each from unit no-1 & 2) (B) Answer any ONE out of TWO 05 Marks (one question each from unit no-3 & 4) **TOTAL 10 MARKS**	