A.G& S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE

VUYYURU-521165, KRISHNA Dt., A.P.(Autonomous)

Accredited by NAAC with "A" Grade

2020-2021

DEPARTMENT OF MATHEMATICS

MINUTES OF BOARD OF STUDIES

ODD SEMESTER

15-07-2020

Minutes of the meeting of BOS in Mathematics for B.Sc Degree Courses of AG & SG Siddhartha Degree College of Arts & Science, Vuyyuru, held at 12.00 Noon on 15 – 07 – 2020.

N.V. Srinivasa Rao — *Presiding*

Members Present:

1)	(N.V. Srinivasa Rao)	Chairman	Head, Department of Mathematics, AG & SG S Degree College.
2)	(Dr. K. Naveen Kumar)	University Nominee	Department of Mathematics, K.B.N Degree College, Vijayawada.
3)	(Dr B. Jagan Mohan Rao)	Subject Expert	Prof and HOD of Mathematics, Sir C.R.R College, Eluru.
4)	(Dr J.Vijayasekhar)	Subject Expert	Associate. Professor, Department of Mathematics, School of Science, GITAM University, Hyderabad.
5)	(Dr P.Srinivasa Rao)	Subject Expert Alumni member	Director and Principal, Sri Srinivasa Educational Institutions, Vuyyuru.
6)	(D. Sunitha)	Member	Lecturer in Mathematics AG & SG S Degree College.
7)	(A. Bhargavi)	Member	Lecturer in Mathematics AG & SG S Degree College.
8)	(Noor Mohammad)	Member	Lecturer in Mathematics AG & SG S Degree College.
9)	(K. Rajya Lakshmi)	Member	Lecturer in Mathematics AG & SG S Degree College.
10)	(Sk. Ayesha Begum)	Student Member	III B.Sc M.C.Cs AG & SG S Degree College.
11)	(K. Naga Sri Lakshmi)	Student Member	III B.Sc M.P.C (T) AG & SG S Degree College.

Agenda of B.O.S Meeting:

1. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics for 1st Semester as per the guidelines and instructions under CBCS prescribed by Krishna University from the Academic Year 2020-21.
2. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics for 3rd Semester as per the guidelines and instructions under CBCS prescribed by Krishna University from the Academic Year 2020-21.
3. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Mathematics for 5th Semester as per the guidelines and instructions under CBCS prescribed by Krishna University from the Academic Year 2020-21.
4. To note any changes in the syllabus are made by APSCHE for the academic year 2020-21.
5. Any other matter.

Resolutions.

1. Discussed and recommended that no changes are required in syllabi, Model Question Papers and Guidelines for question paper setters in Mathematics for the 1st Semester for the Academic year 2020-21.
2. Discussed and recommended that no changes are required in syllabi, Model Question Papers and Guidelines for question paper setters in Mathematics for the 3rd Semester for the Academic year 2020-21.
3. Discussed and recommended that changes are required in Syllabi. Model Question Papers and Guidelines to be followed by the question paper setters in Mathematics for 5th Semesters from the Academic year 2020-21. The maximum marks for IA is 30 and SE is 70. Each IA written examination is of 1 Hr. 30 min duration for 20 marks. The tests will be conducted centrally. The average of two such IA is calculated for 20 marks. 5 marks will be allotted basing on Assignment and 5 marks are allotted for attendance. There is no minimum passing for IA and there is no provision for improvement in IA. Even though the candidate is absent for two IA exams/obtain zero marks the external marks are considered (if he/ she gets 40 out of 70) and the result shall be declared as 'PASS' from the Academic year 2020-21.
4. Discussed and recommended to incorporate the 70% of the new syllabus if introduced / made by APSCHE for the academic year 2020-21. The same syllabus shall be incorporated as per the guidelines.
5. Discussed and recommended for organizing seminars, Guest lecturers, Online Examinations and Workshops to upgrade the knowledge of students for Competitive Examinations for the approval of the Academic Council.

N. V. [signature]
Chairman

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MATHEMATICS	**MAT-101**	**I B.Sc**	**w.e.f 2020-2021**
SEMESTER-I		**PAPER-I**	**Max.Marks:70**

Hours/ Week: 6 **DIFFERENTIAL EQUATIONS** **No. of Credits: 5**

UNIT – I (12 Hours), Differential Equations of first order and first degree:
Linear Differential Equations; Differential Equations Reducible to Linear Form; Exact Differential Equations; Integrating Factors; Change of Variables.

UNIT – II (12 Hours): Orthogonal Trajectories, Differential Equations of first order but not of the first degree.
Equations solvable for p, Equations solvable for y, Equations solvable for x, Equations that do not contain x (or y), **Equations homogeneous in x and y**, Equations of the first degree in x and y – Clairaut's Equation.

UNIT – III (14 Hours), Higher order linear differential equations-I :
Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.
General Solution of f(D)y=0
General Solution of f(D)y=Q when Q is a function of x.
1/f (D) is Expressed as partial fractions.
P.I. of f(D)y = Q when Q= be^{ax}
P.I. of f(D)y = Q when Q is b sin ax or b cosax.

UNIT – IV (12 Hours), Higher order linear differential equations-II :
Solution of the non-homogeneous linear differential equations with constant coefficients.
P.I. of f(D)y = Q when Q= bx^k
P.I. of f(D)y = Q when Q= $e^{ax}V$
P.I. of f(D)y = Q when Q= xV
P.I. of f(D)y = Q when Q= x^mV

UNIT –V (10 Hours), Higher order linear differential equations-III :
Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, **Legendre's linear equations, Miscellaneous differential equations.**

Reference Books :
1. Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Learning Pvt. Ltd. New Delhi-Second edition.
2. A text book of mathematics for BA/BSc Vol 1 by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.
3. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.
4. Differential Equations with applications and programs – S. BalachandraRao& HR Anuradha universities press.

Co – Curricular Activities(15 Hours) :
Seminar/ Quiz/ Assignments/ Project on Application of Differential Equations in Real life Problem/ Problem solving.

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DEPARTMENT OF MATHEMATICS

Question Paper Guidelines for SEMESTER-END Examinations

Time: 3 HrsMAT-101 Max.Marks:70 Min. Marks: 28

Note :- 1). Answer any FOUR questions out of 8 in Section-A. Each question carries 5 marks
(4x5=20 Marks)

2). Answer any FIVE questions out of 8 in Section-B. Each question carries10 marks.
(5x10=50 Marks)

Questions to be set as follows:

Blue Print for Question Paper pattern.

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Section-A (Short answer questions)	2	2	2	1	1
Section-B (Essay questions)	1	1	2	2	2

---The End---

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MATHEMATICS	**MAT-101**	**I B.Sc**	**w.e.f 2020-2021**

SECTION – A (Short Answer Questions)

Answer any **FOUR** of the following questions **4X5=20M**

1. Solve $(1+xy)xdy+(1-xy)ydx=0$
2. Solve $x\frac{dy}{dx}+y=y^2\log x$
3. Solve $y+px=p^2x^4$
4. Solve $x^2(y-px)=p^2y$
5. Solve $(D^2-5D+6)y=e^{4x}$
6. Solve $(D^2+4)y=\text{Cos}\,2x$
7. Solve $(D^2-5D+6)y=xe^{4x}$
8. Solve $[(1+x)^2D^2+(1+x)D+1]y=4C\,\text{os}\log(1+x)$ by legender's equation

SECTION - B

Answer any **FIVE** questions. **5x10 = 50M**

9. Solve $x^2ydx-(x^3+y^3)dy=0$
10. Show that the family of confocal conics $\frac{x^2}{a^2+\lambda}+\frac{y^2}{b^2+\lambda}=1$ is self orthogonal
11. Solve $(D^2-4D+3)y=\sin 3x\cos 2x$
12. Solve $(D^2-3D+2)y=\cosh x$
13. Solve $(D^2-2D+4)y=8(x^2+e^{2x}+\sin 2x)$
14. Solve $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+13y=8e^{3x}\sin 2x$
15. Solve $x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}+y=\frac{1}{(1-x)^2}$
16. Solve $(D^2+a^2)y=\tan ax$ by the method of Variation of Parameters

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MATHEMATICS MAT-301 B.Sc.(E.M,T.M& CS)w.e.f: 2019-2020

SEMESTER-III PAPER-III Max.Marks:100

Hours per week: 6 **Abstract Algebra and Real Analysis-I** **No.of Credits:5**

UNIT – 1 : (10Hrs) GROUPS : -

Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementaryproperties Finite and Infinite groups – examples – order of a group. Composition tables with examples.

UNIT – 2 : (10Hrs) SUBGROUPS : -

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition– examples-criterion for a complex to be subgroups.Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Co-sets and Lagrange's Theorem: -Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange'sTheorem.

UNIT –3 : (12Hrs) NORMAL SUBGROUPS : -

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Subgroup of index 2 is a normal sub group – simple group – quotient group – criteria for the existenceof a quotient group.

UNIT – 4 (14hrs) : REAL NUMBERS :

The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supreme property; intervals. **No. Question is to be set from this portion**.

Real Sequences: Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchey's general principle of convergence theorem.

UNIT –5 (14hrs) : INFINITIE SERIES :

Series: Introduction to series, convergence of series. Cauchey's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test, 2. Cauchey's n^{th}root test or Root Test. 3. D'-Alemberts' Test or Ratio Test.
4. Alternating Series – Leibnitz Test. Absolute convergence and conditional convergence.

Reference Books:

1. Abstract Algebra, by J.B. Fraleigh, Published by Narosa Publishing house.
2. Real Analysis by Rabert&Bartely and .D.R. Sherbart, Published by John Wiley.
3.A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, Published byS.Chand& Company, New Delhi.
4.Modern Algebra by M.L. Khanna.

Suggested Activities:

Seminar/ Quiz/ Assignments/Group discussions.

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EXAMINATION AT THE END OF THE THIRD SEMESTER (w.e.f 2019-20)

Mathematics Paper III MAT- 301 Max. Marks: 70Pass Mark: 28 Time: 3 hrs.

Abstract Algebra and Real Analysis

Section – A (short answer questions)

Answer any **Four** of the following questions. **4x5 = 20M**

Choosing at least ONE question from each Part.

Part - I

1. Show that in a group G for a, b∈ G, $(a\ b)^2 = a^2\ b^2 \Leftrightarrow$ G is abelian.
2. If H, K is two sub groups of a group G, then show that H∩K is also a sub group of G.
3. State and prove Lagrange's Theorem.
4. A subgroup H of a group G is normal subgroup iff$xHx^{-1}=H$, for all x∈ G.

Part - II

5. Every convergent sequence is bounded? Is the converse true?
6. Show that the sequence $S_n = \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \ldots\ldots\ldots + \frac{1}{n+n}$ is convergent.
7. Test for convergence of $\sum \sqrt{n+1} - \sqrt{n}$
8. Examine the conditionally convergence of $\sum (-1)^{n+1} \frac{n}{n^2+1}$

Section – B (long answer questions)

Answer any **FIVE** of the following questions. **5x10 = 50M**

Choosing at least TWO questions from each Part.

Part - I

9. Show that the set of Q^+ of all +ve rational numbers forms an abelian group under the composition defined by 'o' such that aob= $\frac{ab}{3}$ for a, b ϵ Q^+.
10. If H is a non-empty complex of a group G. The necessary and sufficient condition for H to be a sub group of G is a, b$\in$H $\Longrightarrow ab^{-1} \in H$ here b^{-1} is the inverse of b.
11. If H_1, H_2 are two subgroups of a group G, then $H_1 \cup H_2$ is a sub group of G if and only if $H_1 \subseteq H_2$ (or) $H_1 \subseteq H_2$.
12. A subgroup H of a group G is normal subgroup of G iff the product of two right (left) cosets of H in G is again a right (left)coset of H in G.

Part - II

13. A sequences is convergent if and only if it is a Cauchy's sequence
14. State and prove Cauchy's First theorem on sequence.
15. Test for convergence of $\sum \frac{1.3.5.....(2n-1)}{2.4.6.....2n} x^{n-1}$ (x>0)
16. State and prove Leibnitz's test.

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DEPARTMENT OF MATHEMATICS

Question Paper Guidelines for SEMESTER-END Examinations

Time: 3 Hrs. **MAT-301** **Max.Marks:70** **Min. Marks: 28**

Note :- 1). Answer any **FOUR** questions out of 8 in Section-A. Each question Carries 5 marks. (4x5=20 Marks)

2). Answer any **FIVE** questions out of 8 in Section-B. Each question Carries10 marks. (5x10=50 Marks)

Questions to be set as follows:

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Section-A (Short answer questions)	1	2	1	2	2
Section-B (Essay questions)	1	2	1	2	2

---The End---

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MATHEMATICS	MAT-501	III B.Sc	w.e.f 2019-20

SEMESTER-V **PAPER-V** **Max.Marks:70**

Hours/ Week: 5 **No. of Credits: 5**

VECTOR CALCULUS &RING THEORY

UNIT – 1: VECTOR DIFFERENTIATION: - **(12 hrs)**

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, divergence, Curl operators, Formulae Involving these operators.

UNIT – 2: VECTOR INTEGRATION: - **(10 hrs)**

Line Integral, Surface Integral and Volume integral with examples.

UNIT – 3: VECTOR INTEGRATION APPLICATIONS: - **(12 hrs)**

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

UNIT – 4: RINGS-I: - **(14 hrs)**

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring – The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

UNIT – 5: RINGS-II: - **(12 hrs)**

Definition of Homomorphism – Homorphic Image – Elementary Properties of Homomorphism – Kernel of a Homomorphism – Fundamental theorem of Homomorphism

Maximal Ideals – Prime Ideals.

Reference Books:-

1. Abstract Algebra by J. Fralieh, Published by Narosa Publishing house.

2. Vector Calculus by SanthiNarayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.

3. A text Book of B.Sc., Mathematics by B.V.S.S.Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.

4. Vector Calculus by R. Gupta, Published by Laxmi Publications.

5. Vector Calculus by P.C. Matthews, Published by Springer Verlagpublicattions.

6. Rings and Linear Algebra by Pundir&Pundir, Published by PragathiPrakashan.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications

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DEPARTMENT OF MATHEMATICS

Question Paper Guidelines for SEMESTER-END Examinations

Time: 3 Hrs MAT- 501 Max.Marks:70Min. Mark: 28

Note :-1) Answer any FOUR questions out of 8 in Section-A. Each question Carries 5 marks. (4x5=20 Marks)

2) Answer any FIVE questions out of 8 in Section-B. Each question Carries 10 marks. (5x10=50 Marks)

Questions to be set as follows:

Blue Print for Question Paper pattern.

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Section-A (Short Answer Questions)	2	2	1	2	1
Section-B (Essay Questions)	2	1	2	2	1

-The End -

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EXAMINATION AT THE END OF FIFTH SEMESTER (w.e.f 2019-20)

MATHEMATICS Paper V MAT- 501 MAX.MARKS: 70 TIME: 3 hrs

(VECTOR CALCULUS AND RING THEORY)

Section – A (short answer questions)

Answer any Four of the following questions. 4x5 = 20M

Choosing at least ONE question from each Part.

Part - I

1) If r = $a\cos ti + asintj + at\ tan\theta k$ find $\left|\frac{dr}{dt} \times \frac{d^2r}{dt^2}\right|$ and $\left[\frac{dr}{dt}\frac{d^2r}{dt^2}\frac{d^3r}{dt^3}\right]$

2) Find div f and curl f where $f = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$.

3) If $F = 3xyi - y^2j$ evaluate $\oint_c F \cdot dr$ where 'c' is the curve $y = 2x^2$ in the xy plane from (0, 0) to (1, 2).

4) If $F = 2xzi - xj + y^2k$ evaluate the $\int_v F \cdot dv$ where v is the region bounded by the surface $x = 0$, $x = 2$, $y = 0$, $y = 6, z = x^2, z = 4$.

Part - II

5) State and prove Green's theorem in a plane.

6) Prove that $Z_m = \{0,1,2,3,\ldots\ldots\ldots m\text{-}1\}$ is a ring with respect to addition and multiplication modulo 'm'

7) Prove that a field has no Zero divisors.

8) If f is homomorphism of a ring R into a ring R^1 then kerf is an ideal of R

Section – B (long answer questions)

Answer any **FIVE** of the following questions. **5x10 = 50M**

Choosing at least TWO questions from each Part.

Part - I

9) Prove that $\text{grad}(A \cdot B) = (B \cdot \nabla)A + (A \cdot \nabla)B + B \times \text{curl}\, A + A \times \text{curl}\, B$.

10) Evaluate $\int_s F \cdot N ds$ where $F = zi + xj - 3y^2zk$ and s is the surface $x^2 + y^2 = 16$ included in the first octant between z=0 and z =5.

11) State and prove Gauss divergence Theorem.

12) Verify Green's Theorem in the plane for $\oint_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where c is the region bounded by $y = \sqrt{x}$ and $y = x^2$.

Part - II

13) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$at the point P (1, 2, 3) in the direction of the line PQ where Q = (5, 0, 4).

14) Define Field. Prove that every field is an integral domain.

15) Prove that Q ($\sqrt{2}$) = {a + b$\sqrt{2}$ / a, b ∈ Q} is a ring with respect to ordinary addition and multiplication.

16) State and prove fundamental theorem of ring homomorphism.

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MATHEMATICS	MAT-502	III B.Sc	w.e.f 2019-20

SEMESTER-V **PAPER-VI** **Max.Marks:70**

Hours/ Week: 5 **LINEAR ALGEBRA** **No. of Credits: 5**

UNIT –I Matrix: **(12 hrs)**

Matrices, Elementary Properties of Matrices, Triangular form, Echelon form, Normal form Inverse Matrices, Non – Singular form, Rank of Matrix, Linear Equations, Characteristic Roots, Characteristic Vectors of square Matrix, Cayley – Hamilton Theorem.

UNIT – II Vector Spaces-I: **(12 hrs)**

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT –III Vector Spaces-II: **(12 hrs)**

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT –IV Linear Transformations: **(12 hrs)**

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

UNIT –V Inner product space: **(12 hrs)**

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity.

Reference Books:

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut- 250002.
2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition 2007.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on "Applications of Linear algebra Through Computer Sciences"

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DEPARTMENT OF MATHEMATICS

Question Paper Guidelines for SEMESTER-END Examinations

Time: 3 Hrs MAT- 502 Max.Marks:70 Min. Mark: 28

Note :-1) Answer any FOUR questions out of 8 in Section-A. Each question Carries 5 marks. (4x5=20 Marks)

2) Answer any FIVE questions out of 8 in Section-B. Each question Carries 10 marks. (5x10=50 Marks)

Questions to be set as follows:

Blue Print for Question Paper pattern.

	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5
Section-A (Short Answer Questions)	2	1	1	2	2
Section-B (Essay Questions)	2	1	1	2	2

-The End -

A.G & S.G SIDDHARTHA DEGREE COLLEGE OF ARTS AND SCIENCE,
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EXAMINATION AT THE END OF FIFTH SEMESTER (w.e.f 2019-20)

MATHEMATICS Paper VI MAT- 502 MAX.MARKS: 70 TIME: 3 hrs

LINEAR ALGEBRA

Section – A (short answer questions)

Answer any Four of the following questions. 4x5 = 20M

Choosing at least ONE question from each Part.

Part - I

1) Show that the rank of the transpose of a matrix is equal to the rank of the original matrix. i.e., $\rho(A) = \rho(A^T)$.

2) Find the rank of the matrix $\begin{bmatrix} 1 & -2 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 0 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$ by reducing it in the Normal form

3) If S is a subset of a vector space V(F), then prove that S is a subspace of V$\Leftrightarrow L(S) = S$

4) Let w1 and w2 be two subspaces of R^4 given by w_1 ={(a,b,c,d) ;b-2c+d=0}, w_2={(a,b,c,d); a=d, b=2c}.Find the basis and dimension (i)w_1 (ii)w_2 (iii) $w1 \cap w2$ and hence find the $dim(w1 + w2)$

Part - II

5) Let T:$R^2 \to R^2$ be a linear transformation defined by T(1,0)=(1,1),T(0,1)=(-1,2) then find a linear transformation T

6) The mapping T: $V_3(R) \rightarrow V_2(R)$ is defined by T(x, y, z) = (x – y , x – z) is a linear transformation.

7) State and prove Cauchy – Schwarz's inequality

8) State and prove Triangle inequality

Section – B (long answer questions)

Answer any **FIVE** of the following questions. **5x10 = 50M**

Choosing at least TWO questions from each Part.

Part - I

9) State and prove Cayley – Hamilton theorem in Matrices.

10) Find the characteristic roots and the corresponding characteristic vectors of the matrix

$A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$

11) Let V (F) be a vector space. A non-empty set W⊆V. The necessary and sufficient condition for W to be a subspace of V is a,b ∈F and $\alpha, \beta \in V \Longrightarrow a\alpha + b\beta \in W$

12) Let W be a subspace of a finite dimensional vector space V(F) then

$\dim V/W = dimV - dimW.$

Part - II

13) Find the linear Transformation T(x, y, z) where T : $R^3 \rightarrow R$ isdefined by

T(1, 1, 1) = 3, T(0, 1, -2) = 1 and T(0, 0, 1) = -2.

14) State and prove Rank-nullity theorem

15) State and prove Bessel's inequality

16) If (1, 0, 1, 1) (-1, 0,-1, 1) (0,-1, 1, 1) forms a basis of a subspace of $R^4(R)$use Gram-Schmidt process to obtain an orthonormal basis.

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