P.R.Government College (Autonomous), Kakinada
III year B.Sc., Degree Examinations- V Semester (w.e.f 2016-17)
Paper III (Advanced) Core Course: Linear algebra

Total Hrs. of Teaching-Learning: 45 @ 3h / Week Total Credits: 03

Objective:

- To improve the students ability of understanding the most application oriented topic in Mathematics that is Linear Algebra.
- To equip the skill of understanding the concepts and writing the proofs of the Theorems.

Module-I : Vector Space and Linear Transformations

Unit 1: Vector spaces-Definition, Subspace, Algebra subspaces , Linear combination of vectors, Basis and Dimension, Linear sum of subspaces, Quotient spaces. **(14 hrs)**

Unit 2: Linear transformations – Definition ,Rangespace and NullSpace, Algebra of linear transformations, Linear transformations-Matrices. **(9 hrs)**

Module-II: Characteristic Values and Characteristic Vectors and Inner Product spaces

Unit 3: Characteristic Values and Characteristic Vectors- Cayley-Hamilton Theorem (for matrices) **(9 hrs)**

Unit 4: Inner Product spaces – Definitions and examples ,orthogonality and ortho normality, Gram-Schmidt Orthogonalisation Process. **(13 hrs)**

Prescribed Text Books:

J.N. Sharma & A.R.Vasista, Linear Agebra, Krishna Prakasham Mandir , Meerut.

Books for Reference:

1. III year Mathematics Linear Algebra and Vector Calculus, Telugu Academy.
2. A Text Book of B.Sc. Mathematics Vol III, S.Chand&Co.

QUESTION PAPER PATTERN, SEMESTER-V, PAPER –III CORE

Module	TOPIC	V.S.A.Q	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
Module-I	Vector Space	02	02	02	28
	Linear Transformations	02	03	01	25
Module-II	Char. values and char. vectors	02	02	01	20
	Inner product spaces	02	03	02	33
Total		08	10	06	

V.S.A.Q. = Very Short answer questions (1mark)
S.A.Q. = Short answer questions (5 marks)
E.Q . = Essay questions (8 marks)

Very Short answer questions : 8 x 1M = 08
Short answer questions : 6 x 5M = 30
Essay questions : 4 x 8M = 32

Total Marks 70

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P.R GOVT.COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc. EXAMINATION, MATHEMATICS
MODEL PAPER – V SEMESTER, PAPER-III
Core (Advanced): Linear Algebra

Time: 3 hours Max.Marks: 70M

PART –I

Answer the following questions. Each question carries 1 mark. **8x1M =8M**

1. If S, T are the subspaces of vector space V(F) then L(SUT)= .
2. The standard basis of $V_2(R)$ is.....
3. Define range space.
4. Find the null space of the transformation $T:R^2 \to R^3$ defined by $T(x,y)=(x+y,x-y,y)$
5. Define Eigen vector of a square matrix.
6. Find the Eigen values of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$
7. Find the length of the vector $\alpha=(2,1,1+i)$
8. Write Bessel's inequality.

PART –II

Answer any Six questions by choosing Three from each section. **6 x 5M =30M**

SECTION – A

9. Determine whether the following set of vector is L.D or L.I {(1,-2,1),(2,1,-1)(7,-4,1)}.
10. Show that the set of vectors { (2,1,4),(1,-1,2),(3,1,-2)} form a basis for R^3.
11. Find T(x, y, z) where T: $R^3 \to R$ is defined by T(1,1,1)=3, T(0,1,-2)=1,T(0,0,1)= -2.
12. Let T:$V_4 \to V_3$ be a linear transformation defined by T(α_1)=(1,1,1); T(α_2)=(1,-1,1); T(α_3)=(1,0,-1) then verify that $\rho(T)+\nu(T)=\dim V_4$
13. State and prove rank and nullity theorem.

SECTION – B

14. State and prove Cayley-Hamilton theorem.
15. If A = $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & -1 \\ 0 & 1 & 1 \end{bmatrix}$, test A for diagonalizability.
16. State and Prove Triangle inequality.
17. Prove that $\{(3/5,0,4/5),(-4/5,0,3/5),(0,1,0)\}$ form an orthogonal subset of $R^3(R)$ space.

18. State and prove Parsevel's identity.

PART –III

Answer any Four questions by choosing at least ONE from each section. **4 X 8=32M**

SECTION – C

19. Let V(F)be a vector space and S = $\{\alpha_1, \alpha_2, ... \alpha_n\}$ is a finite subset of non-zero vectors of V(F). Then S is linearly dependent if and only if some vector $\alpha_k \in S$, $2 \le k \le n$, can be expressed as a linear combination of its preceding vectors.
20. Let W be a sub space of a finite dimensional vector space V(F), then prove that dimV/W=dimV-dimW.
21. Find the null space, range, rank and nullity of the transformation T: $R^2 \rightarrow R^3$ defined by $T(x, y) = (x + y, x - y, y)$.

SECTION – D

22. Find the characteristic roots and the corresponding vectors of the matrix

$$A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$$

23. State and Prove Cauchy-Schwarz's inequality.

24. Applying Gram Schmidt process obtain an orthonormal basis of $R^3(R)$ from the basis

$\{(2,0,1), (3,-1,5), (0,4,2)\}$.

19.
20.
21.

P.R.GOVT.COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc. MATHEMATICS, Semester V (w.e.f 2016-2017)

Course Code: Linear Algebra

Total Hrs. of Exercises: 45 hrs @ 3 hr/Week in 15 Sessions

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Suggested topics for Problem Solving Sessions

1. Vector Spaces
2. Basis and Dimensions-I
3. Basis and Dimensions-1I
4. Linear Transformation
5. Characteristic Values and **Cayley** Hamilton Theorem
6. Diagnolizability
7. Inner Product Spaces
8. Orthogonality

PRACTICAL EXAMINATIONS PATTERN

End of the V semester

(Course: Linear Algebra)

PRACTICAL EXAMINATION FOR V semester : 50 Marks

Written examination	: 30 M
Record	: 10 M
Cont. Ass.	: 10 M
TOTAL	: 50 M