Exam Date & Time: 26-Sep-2020 (10:00 AM - 01:30 PM)



PSG COLLEGE OF ARTS AND SCIENCE

Note: Writing 3hrs: Checking & Inserting Image: 30mins

BSc DEGREE EXAMINATION MAY 2020 (Sixth Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS
LINEAR ALGEBRA [14MCU24]

Marks: 75 Duration: 210 mins. **SECTION A** Answer all the questions. 1) If A is non singular and B commutes with A, then show that B commutes with A-1. (2)2) Define characteristic polynomial and characteristic equation of a square (2)matrix A. 3) Define a vector space homomorphism. (2) 4) Prove that w is a subspace of v. (2)5) Define an algebraic number. (2)6) Define a root of multiplicity m. (2) 7) Define algebra. (2)8) Define the matrix of a linear transformation T. (2) 9) Define similar transformations. (2)10) Define the Hermitian adjoint of a linear transformation T. (2)

SECTION B

Answer all the questions.

11)

- Show that $\frac{1}{2}\begin{bmatrix} 1+i & -1+i \\ 1+i & 1-i \end{bmatrix}$ is an unitary matrix. (5)
- [OR]
 b)
 Find the characteristic roots of the matrix $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{pmatrix}$. (5)
- (i) Define linearly independent set.
 (ii) If v₁, v₂,.... v_n are in V then prove that either they are linearly
 - (ii) If $v_1, v_2, ..., v_n$ are in V then prove that either they are linearly independent or some v_k is a linear combination of the preceding ones $v_1, v_2, ..., v_{k-1}$.
- [OR] b) If $u, v \in v$ then prove that $|(u, v)| \le ||u|| ||v||$. (5)
- If a,b in k are algebraic over F then prove that a±b, ab and a/b (if b≠0) are all algebraic over F.

 (5)
- [OR]
 b) State and prove the remainder theorem. (5)
- If V is finite dimensional over F, prove that T∈A(V) is invertible if and only if the constant term of the minimal polynomial for T is not zero.

 (5)
 - [OR]
 b)
 If V is finite dimensional over F, prove that T∈A(V) is regular if and only if T maps V onto V. (5)
- If V is n-dimensional over F, prove that T∈A(V) has all its characteristic roots in F, prove that T satisfies a polynomial of degree n over F. (5)
- - b) If $T \in A(V)$ is such that (vT, v)=0 for all $v \in V$, prove that T=0. (5)

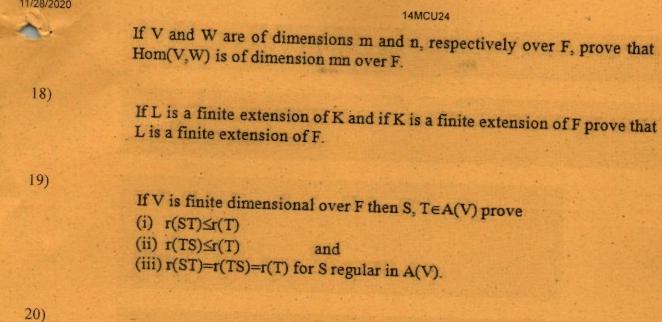
SECTION C

Answer 3 out of 5 questions.

- State and prove the Cayley-Hamilton theorem. (10)
- 17)

https://examcloud.in/epn/reports/exam-qpaper.php

2/3



V in which the matrix of T is triangular.

If T∈A(V) has all its characteristic roots in f, prove that there is a basis of

(10)

(10)

(10)

----End----