College of Science and Technology
S.Y.B.Sc (Computer Science)

Linear Algebra using Python

Q.P. CODE : USCS302
(Time: 2½ hours)
Total Marks: 75

N.B :-

1. All questions are compulsory.
2. Make suitable assumptions wherever necessary and state the assumptions made.
3. Answers to the same question must be written together.
4. Numbers to the right indicate marks.
5. Draw neat labelled diagrams wherever necessary.

Q.1 Attempt any four out of six. (Each question carries 5 marks)

1) Convert $z = (-1 + i\sqrt{3})$ into polar form and exponential form.

2) Find square root of $z = 21 - 20i$.

3) Define field and give one example of it.

4) Prove that set of complex numbers C is a vector space over the field of real numbers R.

5) Show that the intersection of two subspaces W_1 and W_2 of a vector space V is also a subspace of

   V.

6) Consider the following system of equations and find the nature of solution without solving it.

   i) $x_1 + x_2 = 4$ ii) $x_1 + x_2 = 3$

   $2x_1 + 2x_2 = 8$ $x_1 - x_2 = -1$

Q.2 Attempt any four out of six. (Each question carries 5 marks)

1) Write a short note on types of Matrices.

2) Find adjoint matrix of $A = [1\ 3\ 4\ 2\ 5\ 1\ 7\ 4\ 2]$.

3) Find the inverse of a matrix of $A = [1\ 2\ 3\ -1\ 1\ 0\ 3\ 1\ 2]$ using elementary transformation.

4) Solve the following system of equations by Gaussian Elimination method.

   $5x + 4y - z = 0,\ 10y - 3z = 11,\ z = 3.$

5) Show that the Kernel of a linear function is a subspace.

6) Show that the function $f: R^2 \rightarrow R^2$ is a linear function if $f(x, y) = (x + y, x-y)$.

Q.3 Attempt any four out of six. (Each question carries 5 marks)

1) Define Inner product with one example.

2) Verify Cauchy's Schwartz's inequality if $u = (1, 2, -1)$ and $v = (3, 2, -1)$.

Pune Vidyarthi Griha's

College of Science and Technology
S.Y.B.Sc (Computer Science)

Linear Algebra using Python
(Time: 2½ hours)

Q.P. CODE: USCS302

Total Marks: 75

3) State and prove Pythagorean theorem.

4) Define Orthonormal Basis and Construct an orthonormal basis of R^2 by Gram- Schmidt process of S = {(3, 1), (4, 2)}.

5) Find Eigen values of A = [8 − 8 − 2 4 − 3 − 2 3 − 4 1].

Also find Eigen vector corresponding to eigen value $\lambda = 1$.

6) After close analysing the weather for several years, a meteorologist concludes: The chance of a day after a sunny day is sunny 80% and cloudy 20% of the time. The chance of a day after a cloudy day is sunny 60% and cloudy 40% of time. Find the long-range trend.

Q.4 Attempt any five out of six. (Each question carries 5 marks)

1) If Z_1 = -2 + i $\quad$ Z_2 = 2 + 3i then find i) $Z_1 + Z_2$ $\quad$ ii) $Z_1 + Z_2$ $\quad$ iii) $Z_1.Z_2$

2) If u = (1, 2,3) and v = (2, 7, -5) find i) Length of u $\quad$ ii) Length of v $\quad$ iii) u.v

3) Find the null space of the matrix A = [2 1 − 4 − 2].

4) If A = [1 2 1 4] and B = [2 3 4 1] Find AB and BA.

5) Verify Caley- Hamilton theorem for A = [1 2 3 4].

6) Write a short note on Singular and Non- Singular matrices.