University of Sargodha

BS 3rd Term Examination 2023

Subject: S.E/I.T **Paper: Linear Algebra (MATH-3215/MATH-201/MATH-203)**

Time Allowed: 02:30 Hours

Maximum Marks: 60

Note: Objective part is compulsory. Attempt any three questions from subjective part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Define Elementary matrix.
ii. Write any two properties of determinant of matrix.
iii. Define Similar matrices.
iv. Compute the indicated quantity $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}^{39}$.
v. Determine whether $x + \sqrt{3}y = 3z$ is linear in x, y and z .
vi. If A is symmetric matrix then prove that A^2 is also symmetric matrix.
vii. Let $u = (3,5), v = (2,8)$ Find cosine of the angle between u and v.
viii. State Cauchy Schwarz Inequality.
ix. Find scalar triple product of given vectors; $u = (3,1,4), v = (2,2,-4), w = (2,4,5)$.
x. Determine whether u and v are orthogonal vectors $u = (2,3), v = (5,-7)$ or not?
xi. Express $(-9,-7,15)$ as linear combination of $(2,1,4), (1,-1,3), (3,2,5)$.
xii. Define Unitary matrix with example.

Subjective Part (3*12)

Q.2. a) Solve the linear system by Guass-Jordan elimination

$$-2y + 3z = 1;$$
$$3x + 6y - 3z = -2;$$
$$6x + 6y + 3z = 5.$$

b) Use the inverse algorithm to find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$.

Q.3. a) Find all the values of λ for which $det(A) = 0$, $A = \begin{bmatrix} \lambda - 2 & 0 & 0 \\ 0 & \lambda - 1 & 1 \\ 0 & 4 & \lambda \end{bmatrix}$

b) Check that $\{(a, b, 0) | a, b \epsilon R\}$ is subspace of R^3 or not?

Q.4. a) Use the Wronskian to show that $f_1 = 1, f_2 = e^x$, and $f_3 = e^{2x}$ are linearly independent vectors.

b) Apply the Gram Schmidt process to transform the basis vectors $u_1 = (1,1,1), u_2 = (0,1,1), u_2 = (0,0,1)$ into an orthogonal basis.

Q.5. Find a matrix P that diagonalize A where $A = \begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$. Also find $P^{-1}AP$.

Q.6. Let $V = \{(x, y), x, y \epsilon R\}$ and $F = R$ then prove that V is vector space over R under the operations given below $(a, b) + (c, d) = (a + c, b + d)$ and $k(a, b) = (ka, kb)$.

------------------------- LK-6607,6608,6610/21-06-23 -------------------------