Sample Paper

M.Sc. (Mathematics) Semester -I

Paper-I (Linear Algebra)

Time : 1 Hour   **Total Marks : 15 Marks**

1. Define   **[5 Marks]**
   - (i)   Dual space
   - (ii)   Adjoint of a linear transformation
   - (iii)   Annihilator
   - (iv)   Invariance
   - (v)   Projection

2. A linear transformation E on $V(F)$ is a projection on some subspace iff it is idempotent $i.e.$ $E^2 = E$

<div align="center">OR</div>

State and prove Sylvester's law of Nullity.   **[5 Marks]**

3. Let E be a linear transformation,

$$E \text{ is a projection} \Leftrightarrow (T - E) \text{ is a projection.}$$

<div align="center">OR</div>

Let $V(F)$ and $V'(F)$ be two $FDVS$, and t be a linear transformation from V into V'. Then

$$rank\ (t) = rank(t^*)$$

where t^* is the adjoint of t.   **[5 Marks]**

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Sample Paper

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Paper-II (Complex Analysis)

Attempt any three question   **Total Marks:15**

1.Using the definition of the integral of f(z) on a given path, evaluate:

$$\int_0^{1+i} z^2 dz$$

2.Find the value of:

$$\int_{|z|=1} \frac{\sin^6 z}{\left[z - \frac{\pi}{6}\right]^3} dz$$

3.Find out the zeros and discuss the nature of singularities of:

$$F(z) = \frac{z-2}{z^2} \sin \frac{1}{z-1}$$

4. Show that function u=cos x coshy is harmonic and find its harmonic conjugate.

5. Find a bilinear transformation that maps the points $z=\infty, i, 0$ into the points

w=$0, i, \infty$.

Time : 1 Hour   **Total Marks : 15**

4. Define   **[5 Marks]**
   (i)   Rigid Body
   (ii)   Moment of Inertia
   (iii)   M.I. about a diameter of the ring
   (iv)   Principal Axes
   (v)   M.I. about an axis through its middle point and perpendicular to the road.

5. Find the product of inertia of a semicircular wire about its diameter and tangent at   its extremity.   **[5 Marks]**

                                    OR

   Prove the Theorem of parallel axes.

6. State and Prove D'Alembert's Principle.   **[5 Marks]**

                                    OR

   To deduce the general equation of motion of a rigid body from D'Alembert's Principle.

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Sample Paper

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Paper-IV (Integral Transform)

Time : 1 Hour   **Total Marks : 15**

1. Define   **[5 Marks]**
  (i) Second translation theorem

  (ii) Initial value theorem

  (iii) Laplace of periodic functions

  (iv) Heaviside's expansion formula

  (v) Convolution

2. Find

$$L^{-1}\left\{\frac{1}{(p^2+1)^2}\right\}$$

OR

Prove the Convolution theorem.   **[5 Marks]**

3. Evaluate

$$\int_0^\infty te^{-2t}\cos t\, dt$$

OR

Evaluate $L\{2^t\}$ **[5 Marks]**

Attempt any three questions   **Total Marks: 15**

1. Solve the system of equations.

$$4x_1 - x_2 = 1$$

$$-x_1 + 4x_2 - x_3 = 0$$

$$-x_2 + 4x_3 = 0$$

   Using Cholesky method.

2. Solve the system of equation:

$$28x+4y-z=32$$

$$x+3y+10z=24$$

$$2x+17y+4z=35$$

   Using Gauss-Seidal method.

3. Find all the roots of the polynomial equation $x^3 - 3x^2 - 6x + 8 = 0$ using the Graeffe's root squaring method.

4. Find the root of the equation $x^3 - 2x - 5 = 0$ by Birge-Vieta method correct upto four places of decimal. Also obtain deflated polynomial.

5. Solve the system of equations.

$$2x_1 - 13x_2 - 3x_3 = 49$$

$$5x_1 - 6x_2 + 17x_3 = 25$$

$$11x_1 - 2x_2 - 4x_3 = -31$$

   Using Relaxation method.