**B.Sc. DEGREE EXAMINATION, APRIL 2017**

**II YEAR — IV SEMESTER**

**MAJOR PAPER VII**

**VECTOR CALCULUS, FOURIER TRANSFORMS AND Z-TRANSFORMS**

**Time : 3 hours Max. Marks : 75**

**SECTION A — (10 × 2 = 20 marks)**

**Answer any *TEN* questions**

1. Define Gradient of a scalar point function.
2. Find the value of m if , is irrotational.
3. Show that is irrotational.
4. Using Green’s theorem, show that where C is the boundary of the rectangular area enclosed by the lines x=0, x=1, y=0, y=2 in the

XOY plane.

1. Find the work done in moving the particle in a force field along the curve from (2,2,1) to (5,8,8).
2. State Gauss Divergence theorem.
3. Show that if S is the surface of the sphere
4. Define Fourier Transform of f(x).
5. State and prove the Linearity property of Fourier Transform.
6. State convolution theorem of Fourier Transform.
7. If , then prove that
8. Find the Z -transform of

**SECTION B — (5 × 5 = 25 marks)**

**Answer any *FIVE* questions**

1. Find the directional derivative of at the point (1,1,1) in the direction specified by . Also find the maximum value of the directional derivative at that point and the unit vector of the direction pertaining to this maximum.
2. Find the equation of the tangent plane to the ellipsoid at the point (1,-1,1).
3. Verify Green’s theorem in the plane for the integral where C is the curve enclosing the region bounded by the parabola y = and the line y=x.
4. Show that the vector field where

is conservative and find its scalar potential.

1. Using Stoke’s theorem evaluate where C is the boundary of the rectangle z=3.
2. Find the Fourier sine transform of f(x) defined as
3. Find the Z – transform of

[P.T.O.]

**SECTION C — (3 × 10 = 30 marks)**

**Answer any *THREE* questions**

1. Show that (i)

(ii) Show that .

1. Prove the necessary and sufficient condition for a vector field to be conservation is that = .
2. Verify Gauss divergence theorem for taken over the cube bounded by the planes *x=0, x=1, y=0, y=1, z=0,z=1.*
3. Using Parseval’s identity for Fourier cosine and sine transforms of evaluate
4. and (ii)
5. Find Z-tranforms of (i) (ii)