**Tutorial 1**

**Lapalace Transform**

**Q.1** Find Laplace transform of:

i) f(t) =

ii) f(t) =

Q.2 If (t) = then S.T. L = .

Q.3 Show that

Q.4 Find Laplace transform of following

i) ii) ii) t iii) .

Q.5 Find Laplace transform of following

i) ii) iii)

Q.6 Find Laplace transform of following

i) ii) iii)

Q.7 Find

i) where f(t) =

ii)

Q. 8 Evaluate following integrals by using Laplace transform

i) dt. ii) dt. iii) dt .

iv) dt. v) dt.

Q.9 S.T. dt = .

Q.10 Find L .

Q.11 Evaluate ) H (t-1) dt.

Q.12 Evaluate ) dt.

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**Tutorial 2**

**Inverse Lapalace Transform**

**Q.1** Find inverse Laplace transform of:

i) ii) iii)

**Q.2** Find inverse Laplace transform of:

i) ii)

**Q.3** Find inverse Laplace transform of: (by convolution method)

i) ii) iii)

**Q.4** Find inverse Laplace transform of:

i) ii) iii)

**Q.5** Find inverse Laplace transform of:

i) f(t)

and f(t) is periodic with period 2.

**Q.6** Solve i) ii) ) iii) )

**Q.7** Solve by using Laplace Transform where y(0) =-3,

y’(0) = 5.

**Q.8** Solve + + = sint, where y(0)=1.

**Q.9** Solve +9y = cos2t when y(0)=1 , y = -1.

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**Tutorial 3**

**Fourier Series**

Q.1 Find the Fourier Series of in and deduce that

Q.2 Find fourier series for f(x) = in (0,2π) also deduce that

i) = + +…………..

ii) = + +…………..

Q.3 Find the Fourier Series for

Hence deduce that

Q.4 Find the Fourier Series for periodic function

Q.5 Find the Fourier series expansion for

Hence deduce that

Q.6 Find the Fourier Series for

Hence deduce that

Q.7 In show that

Q.8 Find the Fourier series of in (-π, π)

Q.9 Find the Fourier series of in (0,3)

Q.10 Find the Fourier expansion for

with period 2.

Q.11 Find half range cosine series for

Q.12 Expand as half range cosine and half range

sine series

Hence show that i) = + +……… ii) = and

iii) = + +…………..

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**Tutorial 4**

**Complex Form of Fourier Series**

Q.1 Obtain Complex form of Fourier series for in where a

is not an integer. Hence deduce that when is a constant other than an integer



Q.2 Obtain complex form of Fourier Series for

*f.*

Q.3 Obtain complex form of Fourier Series of in

Q.4 Define orthogonal and orthonormal set of functions . Is the set of functions

{cosnx} n=1,2,3,….. is orthogonal over (0 ,)

Q.5 Show that the set of functions

is orthogonal over

Q.6 Find Fourier integral representation for

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**Tutorial 5**

**Complex Variables**

Q.1 Define analytic Function and State C-R equations in cartesian coordinates.

Q.2 Show that the real and imaginary part of an analytic function f(z) = u+iv are

harmonic.

Q.3 If f(z) is analytic function with a constant modulus then prove that f(z) is

Constant

Q.4 Show that the following functions are analytic and find it’s derivatives

i) coshz ii)

Q.5 Find the constants a,b,c,d,e if

F(z) = (

is an analytic function.

Q.6 If analytic function then S.T. .

Q.7 Find the analytic function whose real part is

Q.8 Find the analytic function whose imaginary part is

Q.9 Find analytic function f(z) if

Q.10 Find the analytic function f(z) if

Q.11 Find the orthogonal trajectories of the family of curves:

i)

ii)

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**Tutorial 6**

**Conformal Mapping**

Q.1 Define Bilinear transformation, conformal transformation.

Q.2 State standard transformations and show that the bilinear transformation is the resultant of three basic transformations.

Q.3 Find Bilinear transformation which transforms into respectively

Q.4 Find Bilinear transformation which maps the points onto the points by using cross ratio.

Q.5 Find image of of z-plane under the transformation .

Q.6 Find the fixed points of the bilinear transformation . Is this transformation is parabolic.

Q.7 Find the fixed points of the bilinear transformation . Also express it in normal form

Q.8 Show that the transformation transforms the circle x2y2 into

Q.9 S.T. the transformation w = transforms the circle into the circle

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**Tutorial 7**

**Vector Differentiation**

1. If are three non-coplanar vectors prove that ,

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1. Prove that the points are coplanar.
2. Show that and hence find f if
3. Find the directional derivative of at a point . In the direction of AB where B is
4. Find the constants a and b so that the surface will be orthogonal to the surface at (
5. Prove that .
6. Find f(r) so that the vector f(r) is both Solenoidal and irrotational.
7. A vector field prove that it is irrotational and hence, find its scalar potential.
8. With usual notation, prove that .
9. If prove that

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**Tutorial 8**

**Vector Integration**

Q.1 Prove that along arc from to .

Q.2 Find the workdone when a force = moves the partical in xy plane from to along the parabola . Is the work done different when the path is the straight line y = x.

Q.3Prove that is a conservative field. Find scalar potential of and workdonein moving an object in this field from to

Q.4 State Green’s Theorem and evaluate by Green’s Theorem Where c is the rectangle whose vertices are ,.

Q.5 Verify Green’s Theorem for = and C is the triangle having vertices A, B, C .

Q.6 Find the workdone in amoving particle once round the ellipse in the plane Z= 0 in the force field given by by using Greens theorem.

Q.7 Use Stoke’s Theorem to evaluate where = and C is the area in the plane z = 0 bounded by x = 0, y = 0 and = 1.

Q.8 By using Stoke’s Theorem evaluate , C is the boundary of the region enclosed by circles

Q.9 Use Gauss’s Divergence Theorem to evaluate where = 4x i + 3y j -2z k and S is the surface bounded by x= 0, y = 0, z = 0 and 2x + 2y + z = 4.

Q.10 Use Gauss’s Divergence Theorem to evaluate whereand S is the rrgion bounded by , z = 0,z = 3.

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**Tutorial 9**

**Bessel Function**

Q.1 Show that J1/2 (x) . Hence find J3/2 (X)J5/2  (X) .

Q.2 Show that J\_n (x)-1)n Jn (x) where n is positive integer.

Q.3 Show that JnJnJ2nJ2n+1

Q.4 Show that ( x2 J3 (2X) ) = 2X2 J2 (2X) X J3 (2X) .

Q.5 Show that

Q.6 Show that

Q.7 Show that 5 (X) dx = J4 (X) J3 (X) J2 (X) .

Q.8 Show that ) dx = ().

Q.9 State and prove generating function for Bessels function .

Q.10 In the interval ( 0 , 2 ) Show that 4x x3 = 8 (λn x) .

Where λi are the roots of J1.

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