**ASSIGNMENT PROBLEMS**

**UNIT – I**

**LAPLACE TRANSFORM**

1. Find the Laplace transform of (a) t e-2t sin3t (b) sinh 3t cos2 t
2. Find the Laplace transform of (a)  (b) 
3. Find the Laplace transform of (a) e –t   (b) 
4. (a) Find the Laplace transform

 f(t)=

1. Find the Laplace transform of

 and 

1. Find the value of the integral using Laplace Transform (a)  (b) 

1. Find (a) L-1 {(5s + 3)/(s 2 + 2s+ 5)} (b) L-1 {(3s+2)/(3s2 + 4s + 3)2}
2. Find (a) L-1 { s / (s 2  +1)( s 2  +4)} (b) L -1  { s/(s+2)3}
3. Find (a) L-1{ e -2s/ s(s+1)} (b) L -1 {(s + 1)/ .(s2 + s + 1) }
4. Using Convolution find L -1 { s2 / (s2 +a2)( s2+b2) }
5. Using Convolution find (a) L -1 {s/(s2+1)2 } (b) L -1 {1/(s2+4)2}

**UNIT – II**

**APPLICATIONS OF LAPLACE TRANSFORMS**

Solve the following differential equations

1. y”+4y=sin2t, given y (0)= y’(0)= 0.
2. y” – 2 y’ + 2y = 0 y = y’ = 1 at x = 0
3. y” -2y’ + x = e –t  x( 0) = 2 x’(0) =1
4. y”–y’-2y = 20 sin 2t given y(0) = 0 y’(0) = 2
5. y” + 9 y = 18 t given y(0) = 0 = y(π/2)
6. y” – 3y’ + 2y = e –t  given y(0) = 1 & y’(0) = 0
7. y’’ + 2y’ -5y = e-t sin t given y(0) = 0 and y’(0) = 1

 Solve:

1. given that x(0) = 0, y(0) = 0, x’(0) = 0.
2. given that x(0) = 1, y(0) = 0.

1.  given that x(0) = 8, y(0) = 3.

**Unit – III**

**Complex Variables**

**Assignment – I**

1. Test the analyticity of the functions (i) f(z) = (cos y + i siny) (ii) f(z) =

1. Prove that if w = u +iv is an analytic function then the curves of the family u(x,y) = C1 cut orthogonally the curves of the family v(x,y) = C2 where C1 and C2 are constants
2. (i) If u(x,y)= (x cosy – y sin y) find f(z) so that f(z) is analytic

(ii) Find f(z) whose imaginary part is v = x2 – y2 + 2xy – 3x -2y

1. (i) If u + v = (x – y) (x2+4xy +y2) and f(z) = u + iv find f(z) in terms of z

(ii) If u – v = (cos y – siny) find f(z) in terms of z

1. If f(z) is regular function of z prove that 2 = 4(z)2

**Assignment – II**

1. Find the image of the circle |z| = 2 by the transformation w = z + 3 +2i
2. Find the image of the circle |z-1| = 1 in the complex plane under the mapping w =

1. Find the bilinear transformation which maps the points z1 = -1 z2 = 0 z3 = 1 into the points w1 = 0 w2 = i w3 = 3i respectively
2. Determine the bilinear transformation which maps z1 = 0 z2 = 1 z3 = ∞ into w1 = i w2 = -1 w3 = -i respectively
3. Find the bilinear transformation which transforms (0, -i, -1) into the points (i, 1, 0)

**UNIT IV**

**ASSIGNMENT** I

1. Using Cauchy’s integral formula, evaluate 
 where C is the circle *|z + 1 –i| = 2*.

2. Using Cauchy’s integral formula evaluate 
 where C is the circle |z| = 2.

3. Evaluate using Cauchy integral formula 

 where C is the circle |z| = 3.

4. Find Laurent’s expansion of 

5. Expand  in Laurent’s series if

 (i) |z| < 2 (ii) |z| > 3 (iii) 2 < |2| < 3

6. Find all possible Laurent’s expansions of  about z=0

**UNIT IV**

**ASSIGNMENT** II

1. Find the residues of at each of the poles

2. Using residue theorem evaluate 

3. Using residue theorem evaluate 

4. Using contour integration, prove that 

5. Using residue theorem evaluate 

6. Evaluate  using Contour Integration

**UNIT-V SAMPLING**

**ASSIGNMENT -1**

1.The following are the gains in weights (in gm) of rats fed on two different diets D1 and D2.Gains in weight are

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Diet D1 | 25 | 32 | 30 | 34 | 24 | 14 | 32 | 24 | 30 | 31 | 35 | 25 |  |  |  |
| Diet D2 | 44 | 34 | 22 | 10 | 47 | 31 | 40 | 30 | 32 | 35 | 18 | 21 | 35 | 29 | 22 |

Test if the two diets differ significantly as regards their effect on increase in weight.

 **Solution:** Calculated t =0.609 ,Tabulated t =2.06 for 25 d.f at 5% level.

 Since Calculated t< Tabulated t, the null hypothesis H0 is accepted.

 2.The mean weekly sales of soap bars in departmental store was 146.3 bars per store.After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a s.d of 17.2.Was the advertising campaign successful?

**Solution:** Calculated t =1.97,Tabulated t =1.72 for 21 d.f for single tailed test.

 Since Calculated t > Tabulated t, the null hypothesis H0 is rejected.

3.R andom samples of 400 men and 600 women were asked whether they would like to have a school near their residence.200 men and 325 women were in favour of the proposal.Test the hypothesis that the proportion of men and women in favour of the proposal are same,at 5% level of significance.

 **Solution:** Calculated ІZІ =1.28.Since Calculated І Z І <1.96, the null hypothesis H0 is accepted at 5% level.

4.The means of 2 large samples 1000 and 2000 members are 67.5 inches and 68.0 inches respectively.Can the samples be regarded as drawn from the same population of S.D. 2.5 inches.

 **Solution:** Calculated ІZ І=5.16. Since Calculated І Z І >1.96, the null hypothesis H0 is rejected at 5% level.

5.The nicotine contents in milligrams in two samples of tobacco were found to be as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sample A | 24 | 27 | 26 | 21 | 25 |  |
| Sample B | 27 | 30 | 28 | 31 | 22 | 36 |

 Can it be said that two samples come from same normal population.

 **Solution:** Calculated F = 4.07,Tabulated F for (5,4) d.f at 5% level=6.26.

 Since Calculated F < Tabulated F, the null hypothesis H0 is accepted.

 Calculated t = 1.92,Tabulated t for 9 d.f at 5% level=2.26.

 Since Calculated t < Tabulated t, the null hypothesis H0 is accepted.

**UNIT-V SAMPLING**

**ASSIGNMENT -2**

1.Two random samples gave the following results. Test whether the samples come from the same normal population.

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Size | Sample Mean | Sum of squares of deviations from the mean |
| 1 | 10 | 15 | 90 |
| 2 | 12 | 14 | 108 |

**Solution:** Calculated F =1.018,Tabulated F for (9,11) d.f at 5% level=2.90.

 Since Calculated F < Tabulated F, the null hypothesis H0 is accepted.

 Calculated t =0.74,Tabulated t for 20 d.f at 5% level=2.086.

 Since Calculated t < Tabulated t, the null hypothesis H0 is accepted.

2.The following figures show the distribution of digits in numbers chosen at random from a telephone directory.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Digits | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Frequency | 1026 | 1107 | 997 | 966 | 1075 | 933 | 1107 | 972 | 964 | 853 |

Test whether the digits may be taken to occur equally frequently in the directory.

 **Solution:** Calculated 2 = 58.5442,Degrees of freedom = 9,Tabulated 2 =16.919.

Since calculated 2 > tabulated 2 , we reject the null hypothesis.

3.A die is thrown 264 times with the following results.Show that the die is biased.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No appeared on the die | 1 | 2 | 3 | 4 | 5 | 6 |
| Frequency | 40 | 32 | 28 | 58 | 54 | 60 |

**Solution:** Calculated 2 =17.6362,Degrees of freedom = 5,Tabulated 2 =11.07.

Since calculated 2 > tabulated 2 , we reject the null hypothesis.

4.On the basis of the information noted below, find out whether the new treatment is comparatively superior to the conventional one.

|  |  |  |
| --- | --- | --- |
|  | Favourable | Not Favourable |
| Conventional | 40 | 70 |
| New | 60 | 30 |

**Solution:** Calculated 2 =18.18,Degrees of freedom = 1,Tabulated 2 =3.841

Since calculated 2 > tabulated 2 , we reject the null hypothesis.

5.Given the following contingency table conclude whether the eye colour and hair colour are associated or not.

|  |  |  |  |
| --- | --- | --- | --- |
|  Hair colourEye colour | Fair | Brown | Black |
| Grey | 20 | 10 | 20 |
| Brown | 25 | 15 | 20 |
| Black | 15 | 5 | 20 |

**Solution:**. Calculated 2 =3.6458,Degrees of freedom = 4,Tabulated 2 =9.488

Since calculated 2 < tabulated 2 , we accept the null hypothesis.