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| **SESSION** | **april 2024** |
| **PROGRAM** | **Bachelorof CoMPUTER APPLICATIONS (BCA)** |
| **SEMESTER** | **III** |
| **course CODE & NAME** | **DCA2101 - Computer Oriented Numerical Methods** |
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**SET-I**

**1. Show that**

**(a) δμ= 1/2(∆+∇)**

**(b) ∆-∇=∆∇**

**Ans 1.**

a) To show that δμ=1/2(∆+∇), we can start with the definition of the Laplacian (δ) and the gradient (∇):

δf = ∇²f = ∇•∇f

Now, let's consider the Laplacian of a function μ:

δμ = ∇²μ = ∇•∇μ

Next, we can use the identity that relates the Laplacian and the gradient:

∇•(∇μ) = ∇²μ

Now, we can rewrite the Laplacian of μ using the gradient:

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**2. Find Lagrange’s interpolation polynomial fitting the pointsy(1) = -3,y(3)= 0,y(4)= 30, y(6) = 132 Hence find y(5).**

**Ans 2.**

**Step 1: Find the Lagrange basis polynomials**

For each point, we need to create a Lagrange basis polynomial that has a value of 1 at that point and a value of 0 at all other points. We'll use these polynomials to build the final interpolation polynomial.

For example, for the point (1, -3), the Lagrange basis polynomial is:

**3. Evaluate** $f(15)$***,* given the following table of values:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| $$x$$ | **10** | **20** | **30** | **40** | **50** |
| $$y = f(x)$$ | **46** | **66** | **81** | **93** | **101** |

**Ans 3.**

To evaluate f(15) given the table of values, we need to interpolate the value of y corresponding to x = 15.

Looking at the table, we can observe that the values of x are evenly spaced by 10 units. To interpolate, we can use linear interpolation.

First, let's find the interval in which 15 lies:

- x = 10 corresponds to y = 46

**SET-II**

**4. Find the equation of the best fitting straight line for the data:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X** | **1** | **3** | **4** | **6** | **8** | **9** | **11** | **14** |
| **Y** | **1** | **2** | **4** | **4** | **5** | **7** | **8** | **9** |

**Ans 4.**

Linear Regression is a method to model the relationship between two continuous variables, X and Y. In this case, we have a set of data points (X, Y) and we want to find the best straight line that fits these data points.

**To find the equation of the best fitting straight line, follow these steps:**

**5. Calculate the intercept (b): Finally, calculate the intercept (b) using the formula:**

b = μY - m \* μX

**5. For what value of λ & μ the following system of equations:**

**x + y + z = 6**

**x +2y+3z =10**

**x+2y +λz =μ may have**

**(i) Unique solution**

**(ii) Infinite number of solutions**

**(iii) No solution**

**Ans 5.**

To determine the values of λ and μ that result in each type of solution, we can use the properties of systems of equations.

(i) For a unique solution:

* The rank of the coefficient matrix should be equal to the rank of the augmented matrix.
* The determinant of the coefficient matrix must be non-zero.

(ii) For an infinite number of solutions:

* The rank of the coefficient matrix should be less than the rank of the augmented matrix.

**6. Find the solution for x=0.2 taking interval length 0.1 using Euler’s method to solve: dy/dx=1-y given y(0)=0.**

**Ans 6.**

**Step 1: Understand the problem**

We have the differential equation:

dy/dx = 1 - y

with the initial condition:

y(0) = 0

We want to find the solution y(x) at x = 0.2 using Euler's method with an interval length of 0.1.

**Step 2: Initialize**

We'll start by setting up the initial conditions: