Sub :

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Time : Date : / /

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Course : CSE330

Section : 10

Assignment no: 10

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1

Ans: to the que no: A

$m = 3$

$[a,b] = [1,3]$

$h = \frac{2}{3}$

here

$x_0 = 1$

$x_1 = 1 + \frac{2}{3}$

$x_2 = 2.333$

$x_3 = 3$

$$C_{1,3} = \frac{h}{2}\left[\ln(1) + 2\ln\left(1+\frac{2}{3}\right) + 2\ln(2.333) + \ln(3)\right]$$

$$= 1.27161$$

2

$$\text{Error} = \left| \frac{\int_1^3 \ln x\,dx - 1.27161}{\int_1^3 \ln x\,dx} \right| \times 100\%$$

$$= \left| \frac{1.29584 - 1.27161}{1.29584} \right| \times 100\%$$

$$= 1.8698\ \%$$

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Ans: to the que no: B

1

Closed Newton Cotes.

$$h = \frac{b-a}{n} = \frac{3-1}{2}$$

$$= 1$$

Nodal Points: $x_0 = 1, \quad x_1 = 2$

$$x_2 = 3$$

2

Lagrange Bases:

$$l_0 = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)}$$

$$= \frac{(x-2)(x-3)}{(1-2)(1-3)}$$

$$= \frac{1}{2}(x-2)(x-3)$$

$$l_1 = \frac{(x-1)(x-3)}{(2-1)(2-3)}$$

$$= -\{(x-1)(x-3)\}$$

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$$l_2 = \frac{(x-1)(x-2)}{(3-1)(3-2)}$$

$$= \frac{1}{2}(x-1)(x-2)$$

Weight functions:

$$\sigma_0 = \int_1^3 l_0(x)\,dx$$

$$= \int_1^3 \frac{1}{2}(x-2)(x-3)\,dx$$

$$= \left[\frac{x^3}{3} - \frac{5x^2}{2} + 6x\right]_1^3 \times \frac{1}{2}$$

$$= \left\{\left(\frac{27}{3} - \frac{5\times 9}{2} + 18\right) - \left(\frac{1}{3} - \frac{5}{2} + 6\right)\right\} \times \frac{1}{2}$$

$$= \frac{2}{3} \times \frac{1}{2}$$

$$\sigma_0 = \frac{1}{3}$$

$$\sigma_1 = \int_1^3 -(x-1)(x-3)\,dx$$

$$= -\left[\frac{x^3}{3} - \frac{4x^2}{2} + 3x\right]_1^3$$

$$\sigma_1 = \frac{4}{3}$$

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$$\sigma_2 = \int_1^3 \frac{1}{2}(x-1)(x-2)\,dx$$

$$= \frac{1}{2}\left[\frac{x^3}{3} - \frac{3x^2}{2} + 2x\right]_2^3$$

$$= \frac{1}{3}$$

3

$$I_2(t) = \sigma_0 f(x_0) + \sigma_1 f(x_1) + \sigma_2 f(x_2)$$

$$= \frac{1}{3}\ln(1) + \frac{4}{3}\ln(2) + \frac{1}{3}\ln(3)$$

$$= 1.2904$$

A1

4

Actual Relative Error $= \left|\frac{I - I_2}{I}\right| \times 100\%$

$$= \left|\frac{1.29584 - 1.2904}{1.29584}\right| \times 100\%$$

$$= 0.4198\%$$