Numerical Methods | Assignment - 1 | Due date : 5th Sept, 2017

Ex1 For the following data, calculate the differences and obtain the forward and backward difference polynomials. Interpolate at $x = 0.25$ and $x = 0.35$.

x	0.1	0.2	0.3	0.4	0.5
$f(x)$	1.40	1.56	1.76	2.06	2.28

Ex-2 Prove the following relations :

(i) $\nabla - \Delta = -\Delta\nabla$

(ii) $\Delta + \nabla = \Delta/\nabla - \nabla/\Delta$

Ex-3 The following table of values represents a polynomial of degree $n \leq 3$. Locate any error in the table of values.

x	0	0.1	0.2	0.3	0.4
$f(x)$	2.00	2.11	2.28	2.39	2.56

Ex-4 If $u_{-1} = 10$, $u_1 = 8$, $u_2 = 10$, $u_4 = 50$, find u_0 and u_3.

Ex-5 Prove that Lagrange's interpolation formula can be put in the following form:

$$P_n(x) = \sum_{r=0}^{n} \frac{\phi(x)\, f(x_r)}{(x - x_r)\, \phi(x_r)}$$

where $\phi(x) = \prod_{r=0}^{n} (x - x_r)$

Ex-6 Given the table of values

x	50	52	54	56
$y = \sqrt[3]{x}$	3.684	3.732	3.779	3.825

use Lagrange's interpolation formula to find x when $\sqrt[3]{x} = 3.756$.

Ex-7 Using Lagrange's intp formula, express the function

$$\frac{x^2+6x-1}{(x^2-1)(x-4)(x-6)}$$

as a sum of partial fractions.

Ex-8 Show that n^{th} order divided differences of a polynomial of n^{th} degree are constant.

Ex-9 Write the merits and demerits of Lagrange's method.

Ex-10 Given that $f(1)+f(2)+f(3)=25$, $f(4)=29$ and $f(5)+f(6)=113$, estimate the value of $f(7)$.

Ex-11 Prove the following identity

$$U_1x + U_2x^2 + U_3x^2 + \dots\dots\dots$$
$$= \frac{x}{1-x}U_1 + \frac{x^2}{(1-x)^2}\Delta U_1 + \frac{x^3}{(1-x)^3}\Delta^2 U_1 + \dots\dots\dots$$

Ex-12 Given that
$\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 7 = 0.8451$,
$\log 13 = 1.1139$, $\log 19 = 1.2788$, $\log 37 = 1.5682$
Use appropriate formula to find $\log 37.2$.

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Due date: 5th Sept, 2019