Quiz-1

Name: Farah Jasmin Khan

ID: 19101239

Section: 06

Q#1

We know,

$P_1(x_0) = a_0 + a_1 x_0.$

$\Rightarrow a_0 + a_1 x_0 = 1.$

$P_1(x_1) = a_0 + a_1 x_1$

$\Rightarrow a_0 + a_1 x_1 = 1.82$

$VA = F$

$$\begin{pmatrix} 1 & 0 \\ 1 & 0.6 \end{pmatrix}\begin{pmatrix} a_0 \\ a_1 \end{pmatrix} = \begin{pmatrix} 1 \\ 1.82 \end{pmatrix} \left[\begin{pmatrix} 1 & x_0 \\ 1 & x_1 \end{pmatrix}\begin{pmatrix} a_0 \\ a_1 \end{pmatrix} = \begin{pmatrix} f(x_0) \\ f(x_1) \end{pmatrix} \right]$$

$$V = \begin{pmatrix} 1 & 0 \\ 1 & 0.6 \end{pmatrix} \text{ (Ans)} \quad \left[\begin{matrix} x_0 = 0 \\ x_1 = 0.6 \end{matrix} \right].$$

Q#2

$$V^{-1} = \frac{1}{\det|V|} \text{Adj}|V|.$$

$$\left[\begin{matrix} \det|V| = (0.6-0). \\ V_{11} = (-1)^{1+1}(0.6) = 0.6 \\ V_{12} = (-1)^{1+2}(0) = 0 \\ V_{21} = (-1)^{2+1}(-1) = -1 \\ V_{22} = (-1)^{2+2}(1) = 1 \end{matrix} \right]$$

$$= \frac{1}{(0.6-0)} \begin{vmatrix} 0.6 & 0 \\ -1 & 1 \end{vmatrix}$$

$$= \frac{1}{0.6}\begin{pmatrix} 0.6 & 0 \\ -1 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} \frac{0.6}{0.6} & \frac{0}{0.6} \\ \frac{-1}{0.6} & \frac{1}{0.6} \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 0 \\ -1.6667 & 1.6667 \end{pmatrix} \text{ (Ans)}$$

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Q#3 $a_0 = \frac{x_0 f(x_1) - x_1 f(x_0)}{x_0 - x_1} = \frac{0 - 0.6\times 1}{0-0.6} = 1$

$a_1 = \frac{f(x_0) - f(x_1)}{x_0 - x_1} = \frac{1 - 1.8221}{0-0.6} = 1.3702$

We know

$x_0 = 0$ | $f(x_0) = 1$

$x_1 = 0.6$ | $f(x_1) = 1.8221$

$a_0 = 1$, $a_1 = 1.3702$ (Ans)

Q#4.

① We know, $P_1(x) = a_0 + a_1 x$

$= 1 + 1.3702x$ (Ans)

②. $P_1(0.75) = 1 + (1.3702 \times 0.75) = 2.02765$ (Ans)

③. $f(x) = e^x$

$f(0.75) = e^{0.75} = 2.117$

$P_1(x) = 1 + 1.3702x$

$P_1(0.75) = 2.02765$

Error $= |f(x) - P_1(x)| = |2.117 - 2.02765|$

$= 0.08935$

(Ans)

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(4).

If we would like to reduce the error in the previous part we need to include more node points to ~~avoid~~ get a higher approximation. By adding more degrees/nodes the answer will be more precise. according to weierstrass approximation (Ans)