

$$1) f'(4.1) = \frac{f(u+h) - f(u)}{h}$$

$$= \frac{3.9 - 3.7}{0.1} = 2 \quad (\text{Ans})$$

$$2) f(u) = u \cos(u) - u^2 \sin(u)$$

$$\therefore f'(u) = (1 - u^2) \cos(u) - 3u(\sin u)$$

$$\therefore f'(4.1) = 19.152775$$

$$\therefore \text{Truncation error} = 19.152775 - 2$$

$$= 17.15$$

$$3) \text{Truncation error} = \frac{f^{(3)}(\xi)}{3!} h^2$$

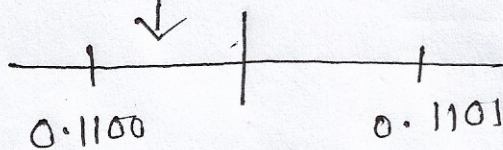
$f(u) = u^4$ $f'''(u) = 24u$ and, $\xi \in [1, 3]$	$= \frac{24 \times 3}{3!} h^2$ $= 12 h^2$ (Ans)
---	--

2(a) Given, $\beta=2$, $m=3$, $e=[-2,1]$

$$\begin{aligned}\therefore \text{Machine Epsilon} &= \frac{1}{2} \cancel{\beta^m} (\beta)^{-m} \\ &= \frac{1}{2} \times (2)^{-3} \\ &= 0.0625 \\ &\quad (\text{Ans.})\end{aligned}$$

$$(b) (-1.54)_{10} = (-0.\boxed{1100}0101\dots\dots) \times 2^1$$

$\therefore m=3$, denormalized



$$\begin{aligned}\therefore (-1.54) \text{ is rounded to} \\ &= -(0.1100)_2 \times 2^1 \\ &= -0.75 \times 2 = -1.5 = fl(x)\end{aligned}$$

$$\begin{aligned}\therefore \text{Round-off error} &= \frac{|-1.5 - (-1.54)|}{|-1.54|} \\ &= 0.025 \\ &= 2.6\% \\ &\quad (\text{Ans.})\end{aligned}$$