(ii) $u(x,0)=0$

$$\frac{\partial u}{\partial t}(x,0)=f(x)$$

where $f(x)=\begin{cases} \frac{2M}{L}\cdot x, & 0<x<\frac{L}{2} \\ \frac{2M(L-x)}{L}, & \frac{L}{2}<x<L \end{cases}$

We know :

$X(x)=\sin\left(\frac{n\cdot\pi}{L}\cdot x\right)$

$T(t)=a\sin(c\nu t)+b\cos(c\nu t)$, $\nu=\frac{n\cdot\pi}{L}$

since $u(x,t)=X(x)T(t)$

$u(x,0)=X(x)\cdot T(0)=0$

$\Rightarrow \cancel{a\sin(0)}+b\cos(0)=0 \quad = b \quad \Rightarrow b=0$

$\Rightarrow T(t)$ becomes: $T(t)=a\sin(c\nu t)$

and $T'(t)=a\frac{c\,n\cdot\pi}{L}\cdot\cos\left(\frac{n\cdot\pi c}{L}\cdot x\right)$

since $\dfrac{\partial u}{\partial t}(x,0) = f(x)$

$$\Rightarrow \sum_{n=1}^{\infty} \frac{a_n \cdot c n \cdot \pi}{L} \cdot \sin\left(\frac{n \cdot \pi}{L} \cdot x\right) = g(x)$$

let $K_n = \dfrac{a_n c n \cdot \pi}{L} \Rightarrow a_n = \dfrac{K_n}{c \cdot n \cdot \pi} \cdot L$

then $$\sum_{n=1}^{\infty} \frac{a_n\, c \cdot n \cdot \pi}{L} \cdot \sin\left(\frac{n \cdot \pi}{L} \cdot x\right) = \sum_{n=1}^{\infty} K_n \sin\left(\frac{n \cdot \pi}{L} \cdot x\right)$$

and $$u_n(x,t) = \sum_{n=1}^{\infty} \sin\left(\frac{n \cdot \pi}{L} \cdot x\right) \cdot a_n \cdot \sin\left(\frac{c \cdot n \cdot \pi}{L} \cdot t\right)$$

with period (in t) $\dfrac{2\cancel{\pi}}{cn\cancel{\pi}} \cdot L = \dfrac{2L}{cn}$