$$\boxed{\frac{\partial^2 y}{\partial t^2} - a^2 \frac{\partial^2 y}{\partial x^2} = 0}$$

$a^2 = 1$

EDenDP(2)LccH.

MSV

$$\frac{\partial^2 y}{\partial t^2} - \frac{\partial^2 y}{\partial x^2} = 0$$

H:

$$y(x,t) = F(x) \cdot G(t)$$

$$\frac{\partial y}{\partial t} = F G' \qquad \frac{\partial^2 y}{\partial t^2} = F G''$$

$$\frac{\partial y}{\partial x} = F' G \qquad \frac{\partial^2 y}{\partial x^2} = F'' G$$

$$F G'' = F'' G \Rightarrow \frac{F''}{F} = \frac{G''}{G}$$

$$\frac{F''}{F} = \alpha \qquad \frac{G''}{G} = \alpha$$

$$\boxed{\alpha = 0} \quad \begin{matrix} F(x) \neq 0 \\ G(t) \neq 0 \end{matrix} \rightarrow y(x,t) \neq 0$$

$$F''(x) = 0 \rightarrow F'(x) = C_1 \rightarrow \boxed{F(x) = C_1 x + C_2}$$

$$y(0,t) = 0 \qquad y(0,t) = F(0) \cdot G(t) \qquad F(0) = 0$$

$$y(1,t) = 0 \qquad y(1,t) = F(1) \cdot G(t) \qquad F(1) = 0$$

$$F(0) \Rightarrow C_1 \cdot (0) + C_2 = 0 \quad \boxed{C_2 = 0} \quad F(x) = C_1 x$$

$$F(1) \Rightarrow C_1 \cdot (1) = 0 \quad \boxed{C_1 = 0} \quad F(x) = 0 \ \forall x.$$

SE DESCARTA

$$\frac{F''}{F} = \alpha \qquad \boxed{\alpha > 0} \qquad \alpha = \beta^2 \quad \forall \beta \neq 0 \in \mathbb{R}$$

$$\frac{F''}{F} = \beta^2 \rightarrow F'' = \beta^2 F \rightarrow F'' - \beta^2 F = 0$$

$$\frac{d^2F(x)}{dx^2} - \beta^2 F(x) = 0 \quad \text{EDO(2)LccH.}$$

$$m^2 - \beta^2 = 0 \quad \text{EC} \quad (m-\beta)(m+\beta) = 0 \qquad m_1 = \beta. \quad m_2 = -\beta.$$

$$\boxed{F(x) = C_1 e^{\beta x} + C_2 e^{-\beta x}} \qquad F(0) = 0 \quad F(1) = 0$$

$$F(0) \rightarrow C_1 e^{\beta(0)} + C_2 e^{-\beta(0)} = 0$$

$$\boxed{C_1 + C_2 = 0} \rightarrow C_2 = -C_1$$

$$F(1) \rightarrow C_1 e^{\beta} + \frac{C_2}{e^{\beta}} = 0$$

$$C_1 e^{\beta} = \frac{C_1}{e^{\beta}} \qquad 1 = \frac{1}{(e^{\beta})^2} \qquad (e^{\beta})^2 = 1 \qquad \beta = 0$$

TAMPOCO NOS SIRVE.

$$\frac{F''}{F} = \alpha \qquad \boxed{\alpha < 0} \qquad \alpha = -\beta^2 \quad \forall \beta \neq 0 \in \mathbb{R}$$

$$\frac{F''}{F} = -\beta^2 \longrightarrow F'' = -\beta^2 F \rightarrow F'' + \beta^2 F = 0$$

$$m^2 + \beta^2 = 0 \qquad \begin{cases} m_1 = +\beta i \\ m_2 = -\beta i \end{cases}$$

$$\boxed{F(x) = C_1 \cos(\beta x) + C_2 \operatorname{sen}(\beta x)} \qquad \begin{cases} F(0) = 0 \\ F(1) = 0 \end{cases}$$

$$F(0) \rightarrow C_1 \cos(0) + C_2 \operatorname{sen}(0) = 0$$

$$C_1 \cdot (1) + C_2 \cdot (0) = 0 \qquad \boxed{C_1 = 0}$$

$$F(x) = C_2 \operatorname{sen}(\beta x) \qquad \boxed{C_2 \neq 0}$$

$$F(1) \Rightarrow C_2 \operatorname{sen}(\beta) = 0 \qquad \operatorname{sen}(\beta) = 0$$

$$\boxed{F(x) = C_2 \operatorname{sen}(n\pi x)} \qquad \boxed{\beta = n\pi}$$

$$\forall n \in \mathbb{Z}$$

$\alpha < 0 \quad \alpha = -\beta^2 \quad \alpha = -n^2\pi^2$

$$\boxed{F(x) = C_2 \operatorname{sen}(n\pi x)}$$

$$\frac{G''}{G} = -n^2\pi^2 \longrightarrow G'' = -n^2\pi^2 G$$

$G'' + n^2\pi^2 G = 0 \quad$ EDO(2) L cc H.

$$m^2 + n^2\pi^2 = 0 \quad \begin{cases} m_1 = -n\pi i \\ m_2 = n\pi i \end{cases}$$

$$\boxed{G(t) = k_1 \cos(n\pi t) + k_2 \operatorname{sen}(n\pi t).}$$

$$\boxed{y(x,t) = \operatorname{sen}(n\pi x)\left(C_{10}\cos(n\pi t) + C_{20}\operatorname{sen}(n\pi t)\right).}$$

$$y_g(x,t) = \sum_{n=1}^{\infty} \operatorname{sen}(n\pi x)\left(b_n \cos(n\pi t) + a_n \operatorname{sen}(n\pi t)\right)$$

$$y(x,t)\Big|_{t=0} = \sum_{n=1}^{\infty} \operatorname{sen}(n\pi x)\left(b_n\right) = \begin{cases} \dfrac{\frac{1}{1000}}{\frac{5}{10}} x \; ; \; 0 \leq x \leq \frac{5}{10} \\[2ex] -\dfrac{\frac{1}{1000}}{\frac{5}{10}} x + \dfrac{2}{1000} \; ; \; \frac{5}{10} < x < 1. \end{cases}$$

$$y_y(x,t) = \sum_{n=1}^{\infty} \operatorname{sen}(n\pi x)\left(b_n \cos(n\pi t) + a_n \operatorname{sen}(n\pi t)\right)$$

$$\frac{\partial y}{\partial t} = \sum_{n=1}^{\infty} \operatorname{sen}(n\pi x)\left(-b_n \operatorname{sen}(n\pi t)\, n\pi + \right.$$

$$\left. + a_n \cos(n\pi t)\, n\pi \right)$$

$$= \sum_{n=1}^{\infty} \operatorname{sen}(n\pi x)\left(-n\pi b_n \operatorname{sen}(n\pi t) + n\pi a_n \cos(n\pi t)\right)$$

$$\left.\frac{\partial y}{\partial t}\right|_{t=0} = 0 \Rightarrow \sum_{n=1}^{\infty} \operatorname{sen}(n\pi x)\left(n\pi a_n\right) = 0 \quad a_n = 0$$

$$\boxed{y_g(x,t) = \sum_{n=1}^{\infty} b_n \operatorname{sen}(n\pi x) \cdot \cos(n\pi t)}$$