SAMPLE 2

1. [**20 points**] Find a solution of initial boundary value problem on halfline (more: Ex. 4, 5, 6, 7 p.132)

$$\begin{aligned} &u_{tt} = u_{xx}, \quad x > 0, \quad t > 0, \\ &u(0,t) = 0, \quad t > 0, \\ &u(x,0) = \sin 5x, \quad u_t(x,0) = x\cos 6x, \quad x > 0. \end{aligned}$$

2. [**50 points**] Solve the initial boundary value problem.(more: Ex.12, 19-22, 24-29 p.133)

$$\begin{aligned} &u_{tt} = 9u_{xx} + 2, \quad 0 < x < 1,\, t > 0, \\ &u(0,t) = t^2, \quad u_x(1,t) = t^2, \quad t > 0, \\ &u(x,0) = x, \quad u_t(x,0) = \sin\left(\frac{\pi}{2}x\right), \quad 0 < x < 1. \end{aligned}$$

3. [**30 points**] Solve the Cauchy problem by applying Fourier transform method. (more: Ex.4, 5, 10 p.164)

$$\begin{aligned} &u_t = 25u_{xx}, \quad x \in \mathbb{R},\, t > 0, \\ &u(x,0) = \frac{1}{x^2+4}, \quad x \in \mathbb{R}. \end{aligned}$$