

# با یاد او

## سری پنجم تمرینات ریاضی مهندسی

مسائل با شرایط مرزی و یا شرایط اولیه مرزی زیر را حل کنید.

$$۱. \Delta u = r\theta, \quad \backslash \leq r \leq e, \quad 0 \leq \theta \leq \pi$$
$$u|_{r=\backslash} = 0, \quad u|_{r=e} = 0, \quad u|_{\theta=0} = 0, \quad u\theta|_{\theta=\pi} = 0$$

$$۲. u_t = \nabla^2 u + xyt, \quad 0 \leq x, y \leq \backslash, t \geq 0$$
$$u(x, y, 0) = ye^x,$$
$$u(0, y, t) = u_x(\backslash, y, t) = u_y(x, 0, t) = u_y(x, \backslash, t) = 0$$

$$۳. u_{tt} = u_{xx} + \nabla^2 u_{yy} + xe^{y+t}, \quad 0 \leq x \leq \pi, -\pi \leq y \leq \pi, t \geq 0$$
$$u(x, y, 0) = xye^x, \quad u_t(x, y, 0) = y,$$
$$u|_{x=0} = u|_{x=\pi} = 0, \quad u|_{y=-\pi} = u|_{y=\pi}, \quad u_y|_{y=-\pi} = u_y|_{y=\pi}$$

$$۴. u_{tt} = \nabla^2 u + xyz, \quad 0 \leq x, y, z \leq \backslash, t \geq 0$$
$$u|_{t=0} = xye^z, \quad u_t|_{t=0} = 0, \quad u|_{x=0} = u|_{x=\backslash} = 0,$$
$$u|_{y=0} = u_y|_{y=\backslash} = 0, \quad u_z|_{z=0} = u_z|_{z=\backslash} = 0$$

$$۵. u_{tt} + u_{xxxx} - u_{yy} = xye^t, \quad 0 \leq x, y \leq \backslash, t \geq 0$$
$$u|_{t=0} = xy, \quad u_t|_{t=0} = e^{x+y},$$
$$u|_{x=0} = u_x|_{x=\backslash} = u_{xx}|_{x=0} = u_{xxx}|_{x=\backslash} = u_y|_{y=0} = u|_{y=\backslash} = 0$$