

Практичне заняття № 13
Контрольна робота №4

Варіант № 1

1.

$$\begin{aligned}u_{tt} - 4u_{xx} &= (x - 1)e^{2t}, \quad (x, t) \in Q := (0, 2) \times (0, 11], \\u|_{x=0} &= 3e^{2t}, \quad u_x|_{x=2} = 0, \quad t \in (0, 11], \\u|_{t=0} &= \sin 2x, \quad u_t|_{t=0} = 1, \quad x \in [0, 2].\end{aligned}$$

2.

$$\begin{aligned}u_{tt} - 16(u_{xx} + u_{yy}) &= y \cos 2t, \quad (x, y, t) \in Q := (0; 2) \times (0; 3) \times (0; 14], \\ \begin{cases} u_x|_{x=0} = 0, & u_x|_{x=2} = 0, & (y, t) \in (0, 3) \times (0, 14], \\ u|_{y=0} = 0, & u_y|_{y=3} = 0, & (x, t) \in [0, 2] \times (0, 14], \end{cases} \\u|_{t=0} &= 3x, \quad u_t|_{t=0} = 7y, \quad (x, y) \in \bar{\Omega} := [0; 2] \times [0; 3].\end{aligned}$$

Варіант № 2

1.

$$\begin{aligned}u_{tt} - 9u_{xx} &= (x - 1)e^{3t}, \quad (x, t) \in Q := (0; 3) \times (0; 10], \\u_x|_{x=0} &= 0, \quad u_x|_{x=3} = 2e^{3t}, \quad t \in (0; 10], \\u|_{t=0} &= \cos 2x, \quad u_t|_{t=0} = 2, \quad x \in [0; 3].\end{aligned}$$

2.

$$\begin{aligned}u_{tt} - 25(u_{xx} + u_{yy}) &= y \cos 2t, \quad (x, y, t) \in Q := (0; 4) \times (0; 3) \times (0; 14], \\ \begin{cases} u|_{x=0} = 0, & u_x|_{x=4} = 0, & (y, t) \in (0; 3) \times (0; 14], \\ u_y|_{y=0} = 0, & u|_{y=3} = 0, & (x, t) \in [0; 4] \times (0; 14], \end{cases} \\u|_{t=0} &= 3y, \quad u_t|_{t=0} = 2x, \quad (x, y) \in \bar{\Omega} := [0; 4] \times [0; 3].\end{aligned}$$

Варіант № 3

1.

$$\begin{aligned}u_{tt} - 16u_{xx} &= (x - 1) \sin 3t, \quad (x, t) \in Q := (0; 3) \times (0; 15], \\u_x|_{x=0} &= 0, \quad u_x|_{x=3} = 2 \sin 3t, \quad t \in (0; 15], \\u|_{t=0} &= 3, \quad u_t|_{t=0} = \cos 2x, \quad x \in [0; 3].\end{aligned}$$

2.

$$\begin{aligned}u_{tt} - 9(u_{xx} + u_{yy}) &= ye^{2t}, \quad (x, y, t) \in Q := (0; 6) \times (0; 4) \times (0; 14], \\ \begin{cases} u_x|_{x=0} = 0, & u_x|_{x=6} = 0, & (y, t) \in (0; 4) \times (0; 14], \\ u_y|_{y=0} = 0, & u_y|_{y=4} = 0, & (x, t) \in [0; 6] \times (0; 14], \end{cases} \\u|_{t=0} &= 3y + 2, \quad u_t|_{t=0} = 4x, \quad (x, y) \in \bar{\Omega} := [0; 6] \times [0; 4].\end{aligned}$$

Варіант № 4

1.

$$\begin{aligned} u_{tt} - 4u_{xx} &= 3x \cos 3t, & (x, t) \in Q &:= (0; 4) \times (0; 16], \\ u|_{x=0} &= 0, & u|_{x=4} &= 2 \cos 3t, & t \in (0; 16], \\ u|_{t=0} &= 3, & u_t|_{t=0} &= \sin 2x, & x \in [0; 4]. \end{aligned}$$

2.

$$\begin{aligned} u_{tt} - 9(u_{xx} + u_{yy}) &= ye^{4t}, & (x, y, t) \in Q &:= (0; 3) \times (0; 4) \times (0; 15], \\ \begin{cases} u_x|_{x=0} = 0, & u|_{x=3} = 0, & (y, t) \in (0; 4) \times (0; 15], \\ u|_{y=0} = 0, & u|_{y=4} = 0, & (x, t) \in [0; 3] \times (0; 15], \end{cases} \\ u|_{t=0} &= 3y, & u_t|_{t=0} &= 4x, & (x, y) \in \bar{\Omega} &:= [0; 3] \times [0; 4]. \end{aligned}$$

Варіант № 5

1.

$$\begin{aligned} u_{tt} - 25u_{xx} &= 5x \cos 4t, & (x, t) \in Q &:= (0; 3) \times (0; 16], \\ u|_{x=0} &= 0, & u_x|_{x=3} &= 2 \cos 4t, & t \in (0; 16], \\ u|_{t=0} &= 3 \sin 2x, & u_t|_{t=0} &= 2, & x \in [0; 3]. \end{aligned}$$

2.

$$\begin{aligned} u_{tt} - 9(u_{xx} + u_{yy}) &= y \sin 4t, & (x, y, t) \in Q &:= (0; 4) \times (0; 4) \times (0; 16], \\ \begin{cases} u|_{x=0} = 0, & u_x|_{x=4} = 0, & (y, t) \in (0; 4) \times (0; 16], \\ u|_{y=0} = 0, & u_y|_{y=4} = 0, & (x, t) \in [0; 4] \times (0; 16], \end{cases} \\ u|_{t=0} &= 3y + 4, & u_t|_{t=0} &= 2x, & (x, y) \in \bar{\Omega} &:= [0; 4] \times [0; 4]. \end{aligned}$$

Варіант № 6

1.

$$\begin{aligned} u_{tt} - 4u_{xx} &= (x - 1)e^{2t}, & (x, t) \in Q &:= (0, 2) \times (0, 11], \\ u|_{x=0} &= 3e^{2t}, & u_x|_{x=2} &= 0, & t \in (0, 11], \\ u|_{t=0} &= \sin 2x, & u_t|_{t=0} &= 1, & x \in [0, 2]. \end{aligned}$$

2.

$$\begin{aligned} u_{tt} - 16(u_{xx} + u_{yy}) &= y \cos 2t, & (x, y, t) \in Q &:= (0; 2) \times (0; 3) \times (0; 14], \\ \begin{cases} u_x|_{x=0} = 0, & u|_{x=2} = 0, & (y, t) \in (0, 3) \times (0, 14], \\ u|_{y=0} = 0, & u_y|_{y=3} = 0, & (x, t) \in [0, 2] \times (0, 14], \end{cases} \\ u|_{t=0} &= 3x, & u_t|_{t=0} &= 7y, & (x, y) \in \bar{\Omega} &:= [0; 2] \times [0; 3]. \end{aligned}$$

Варіант № 7

1.

$$\begin{aligned} u_{tt} - 9u_{xx} &= (x-1)e^{3t}, & (x, t) \in Q &:= (0; 3) \times (0; 10], \\ u_x|_{x=0} &= 0, & u|_{x=3} &= 2e^{3t}, & t \in (0; 10], \\ u|_{t=0} &= \cos 2x, & u_t|_{t=0} &= 2, & x \in [0; 3]. \end{aligned}$$

2.

$$\begin{aligned} u_{tt} - 25(u_{xx} + u_{yy}) &= y \cos 2t, & (x, y, t) \in Q &:= (0; 4) \times (0; 3) \times (0; 14], \\ \begin{cases} u|_{x=0} = 0, & u_x|_{x=4} = 0, & (y, t) \in (0; 3) \times (0; 14], \\ u_y|_{y=0} = 0, & u|_{y=3} = 0, & (x, t) \in [0; 4] \times (0; 14], \end{cases} \\ u|_{t=0} &= 3y, & u_t|_{t=0} &= 2x, & (x, y) \in \bar{\Omega} &:= [0; 4] \times [0; 3]. \end{aligned}$$

Варіант № 8

1.

$$\begin{aligned} u_{tt} - 16u_{xx} &= (x-1) \sin 3t, & (x, t) \in Q &:= (0; 3) \times (0; 15], \\ u_x|_{x=0} &= 0, & u|_{x=3} &= 2 \sin 3t, & t \in (0; 15], \\ u|_{t=0} &= 3, & u_t|_{t=0} &= \cos 2x, & x \in [0; 3]. \end{aligned}$$

2.

$$\begin{aligned} u_{tt} - 9(u_{xx} + u_{yy}) &= ye^{2t}, & (x, y, t) \in Q &:= (0; 6) \times (0; 4) \times (0; 14], \\ \begin{cases} u_x|_{x=0} = 0, & u|_{x=6} = 0, & (y, t) \in (0; 4) \times (0; 14], \\ u_y|_{y=0} = 0, & u|_{y=4} = 0, & (x, t) \in [0; 6] \times (0; 14], \end{cases} \\ u|_{t=0} &= 3y + 2, & u_t|_{t=0} &= 4x, & (x, y) \in \bar{\Omega} &:= [0; 6] \times [0; 4]. \end{aligned}$$

Варіант № 9

1.

$$\begin{aligned} u_{tt} - 4u_{xx} &= 3x \cos 3t, & (x, t) \in Q &:= (0; 4) \times (0; 16], \\ u_x|_{x=0} &= 0, & u|_{x=4} &= 2 \cos 3t, & t \in (0; 16], \\ u|_{t=0} &= 3, & u_t|_{t=0} &= \sin 2x, & x \in [0; 4]. \end{aligned}$$

2.

$$\begin{aligned} u_{tt} - 9(u_{xx} + u_{yy}) &= ye^{4t}, & (x, y, t) \in Q &:= (0; 3) \times (0; 4) \times (0; 15], \\ \begin{cases} u_x|_{x=0} = 0, & u|_{x=3} = 0, & (y, t) \in (0; 4) \times (0; 15], \\ u|_{y=0} = 0, & u|_{y=4} = 0, & (x, t) \in [0; 3] \times (0; 15], \end{cases} \\ u|_{t=0} &= 3y, & u_t|_{t=0} &= 4x, & (x, y) \in \bar{\Omega} &:= [0; 3] \times [0; 4]. \end{aligned}$$

Вариант № 10

1.

$$\begin{aligned}u_{tt} - 25u_{xx} &= 5x \cos 4t, & (x, t) \in Q &:= (0; 3) \times (0; 16], \\u|_{x=0} &= 0, & u_x|_{x=3} &= 2 \cos 4t, & t \in (0; 16], \\u|_{t=0} &= 3 \sin 2x, & u_t|_{t=0} &= 2, & x \in [0; 3].\end{aligned}$$

2.

$$\begin{aligned}u_{tt} - 9(u_{xx} + u_{yy}) &= y \sin 4t, & (x, y, t) \in Q &:= (0; 4) \times (0; 4) \times (0; 16], \\ \begin{cases} u|_{x=0} = 0, & u_x|_{x=4} = 0, & (y, t) \in (0; 4) \times (0; 16], \\ u|_{y=0} = 0, & u_y|_{y=4} = 0, & (x, t) \in [0; 4] \times (0; 16], \end{cases} \\ u|_{t=0} = 3y + 4, & u_t|_{t=0} = 2x, & (x, y) \in \bar{\Omega} &:= [0; 4] \times [0; 4].\end{aligned}$$