

Практичне заняття № 16
Контрольна робота №5

Варіант № 1

1. $\tilde{u}_t - 4\tilde{u}_{xx} = (x+1)t, \quad (x, t) \in Q := (0; 4) \times (0; 10],$
 $\tilde{u}_x|_{x=0} = 0, \quad \tilde{u}|_{x=4} = 2t, \quad t \in (0; 10],$
 $\tilde{u}|_{t=0} = \cos 3x, \quad x \in [0; 4].$
2. $u_t - 9(u_{rr} + \frac{1}{r}u_r) = 2r^2t, \quad (r, t) \in Q := (0; 3) \times (0; 6],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u_r(3, t) = 0, \quad t \in (0; 6],$
 $u|_{t=0} = 3, \quad r \in [0; 3].$

Варіант № 2

1. $\tilde{u}_t - 16\tilde{u}_{xx} = (x+1)e^t, \quad (x, t) \in Q := (0; 5) \times (0; 8],$
 $\tilde{u}_x|_{x=0} = 2e^t, \quad \tilde{u}|_{x=5} = 0, \quad t \in (0; 8],$
 $\tilde{u}|_{t=0} = \cos 3x, \quad x \in [0; 5].$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2 \sin t, \quad (r, t) \in Q := (0; 2) \times (0; 11],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u(2, t) = 0, \quad t \in (0; 11],$
 $u|_{t=0} = 3r^2, \quad r \in [0; 2].$

Варіант № 3

1. $\tilde{u}_t - 25\tilde{u}_{xx} = x \sin t, \quad (x, t) \in Q := (0; 4) \times (0; 10],$
 $\tilde{u}_x|_{x=0} = 0, \quad \tilde{u}|_{x=4} = 2 \sin t, \quad t \in (0; 10],$
 $\tilde{u}|_{t=0} = \cos 3x, \quad x \in [0; 4].$
2. $u_t - 4(u_{rr} + \frac{1}{r}u_r) = 2e^{2t}, \quad (r, t) \in Q := (0; 1) \times (0; 9],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u_r(1, t) = 0, \quad t \in (0; 9],$
 $u|_{t=0} = 3r^2, \quad r \in [0; 1].$

Варіант № 4

1. $\tilde{u}_t - 16\tilde{u}_{xx} = (x+1)e^{3t}, \quad (x, t) \in Q := (0; 6) \times (0; 10],$
 $\tilde{u}_x|_{x=0} = 2e^{3t}, \quad \tilde{u}|_{x=6} = 0, \quad t \in (0; 10],$
 $\tilde{u}|_{t=0} = \sin 3x, \quad x \in [0; 6].$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2r^2 \cos 3t, \quad (r, t) \in Q := (0; 4) \times (0; 11],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u(4, t) = 0, \quad t \in (0; 11],$
 $u|_{t=0} = 5, \quad r \in [0; 4].$

Вариант № 5

1. $\tilde{u}_t - 4\tilde{u}_{xx} = 2x \sin 3t, \quad (x, t) \in Q := (0; 3) \times (0; 14],$
 $\tilde{u}|_{x=0} = 0, \quad \tilde{u}_x|_{x=3} = 2 \sin 3t, \quad t \in (0; 14],$
 $\tilde{u}|_{t=0} = \cos 4x, \quad x \in [0; 3].$
2. $u_t - 4(u_{rr} + \frac{1}{r}u_r) = 2r^2t, \quad (r, t) \in Q := (0; 8) \times (0; 9],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u_r(8, t) = 0, \quad t \in (0; 9],$
 $u|_{t=0} = 3, \quad r \in [0; 8].$

Вариант № 6

1. $\tilde{u}_t - 36\tilde{u}_{xx} = (2x + 1)e^{5t}, \quad (x, t) \in Q := (0; 3) \times (0; 15],$
 $\tilde{u}_x|_{x=0} = 2e^{5t}, \quad \tilde{u}|_{x=3} = 0, \quad t \in (0; 15],$
 $\tilde{u}|_{t=0} = \sin 4x, \quad x \in [0; 3].$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2r^2t, \quad (r, t) \in Q := (0; 5) \times (0; 11],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u(5, t) = 0, \quad t \in (0; 11],$
 $u|_{t=0} = 5, \quad r \in [0; 5].$

Вариант № 7

1. $\tilde{u}_t - \tilde{u}_{xx} = 3x \sin 6t, \quad (x, t) \in Q := (0; 4) \times (0; 15],$
 $\tilde{u}_x|_{x=0} = 0, \quad \tilde{u}|_{x=4} = 2 \sin 6t, \quad t \in (0; 15],$
 $\tilde{u}|_{t=0} = \cos 4x, \quad x \in [0; 4].$
2. $u_t - 4(u_{rr} + \frac{1}{r}u_r) = 2r^2e^{2t}, \quad (r, t) \in Q := (0; 9) \times (0; 10],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u(9, t) = 0, \quad t \in (0; 10],$
 $u|_{t=0} = 4, \quad r \in [0; 9].$

Вариант № 8

1. $\tilde{u}_t - 4\tilde{u}_{xx} = (2x + 1)e^{5t}, \quad (x, t) \in Q := (0; 5) \times (0; 16],$
 $\tilde{u}|_{x=0} = 2e^{5t}, \quad \tilde{u}|_{x=5} = 0, \quad t \in (0; 16],$
 $\tilde{u}|_{t=0} = \sin 5x, \quad x \in [0; 5],$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2r^2e^{8t}, \quad (r, t) \in Q := (0; 4) \times (0; 16],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u(4, t) = 0, \quad t \in (0; 16],$
 $u|_{t=0} = 6, \quad r \in [0; 4].$

Вариант № 9

1. $\tilde{u}_t - 9\tilde{u}_{xx} = 4x \sin 8t, \quad (x, t) \in Q := (0; 3) \times (0; 17],$
 $\tilde{u}|_{x=0} = 0, \quad \tilde{u}_x|_{x=3} = 2 \sin 8t, \quad t \in (0; 17],$
 $\tilde{u}|_{t=0} = \sin 4x, \quad x \in [0; 3].$
2. $u_t - 16(u_{rr} + \frac{1}{r}u_r) = 2e^{4t}, \quad (r, t) \in Q := (0; 5) \times (0; 10],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u(5, t) = 0, \quad t \in (0; 10],$
 $u|_{t=0} = 5r^2, \quad r \in [0; 5].$

Вариант № 10

1. $\tilde{u}_t - 9\tilde{u}_{xx} = 3xe^{5t}, \quad (x, t) \in Q := (0; 3) \times (0; 18],$
 $\tilde{u}|_{x=0} = 2e^{5t}, \quad \tilde{u}|_{x=3} = 0, \quad t \in (0; 18],$
 $\tilde{u}|_{t=0} = 2 \sin 6x, \quad x \in [0; 3].$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 4r^2e^{2t}, \quad (r, t) \in Q := (0; 9) \times (0; 16],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u_r(9, t) = 0, \quad t \in (0; 16],$
 $u|_{t=0} = 2, \quad r \in [0; 9].$

Вариант № 11

1. $\tilde{u}_t - 4\tilde{u}_{xx} = (x + 1)t, \quad (x, t) \in Q := (0; 4) \times (0; 10],$
 $\tilde{u}_x|_{x=0} = 0, \quad \tilde{u}|_{x=4} = 2t, \quad t \in (0; 10],$
 $\tilde{u}|_{t=0} = \cos 3x, \quad x \in [0; 4].$
2. $u_t - 9(u_{rr} + \frac{1}{r}u_r) = 2r^2t, \quad (r, t) \in Q := (0; 3) \times (0; 6],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u_r(3, t) = 0, \quad t \in (0; 6],$
 $u|_{t=0} = 3, \quad r \in [0; 3].$

Вариант № 12

1. $\tilde{u}_t - 16\tilde{u}_{xx} = (x + 1)e^t, \quad (x, t) \in Q := (0; 5) \times (0; 8],$
 $\tilde{u}_x|_{x=0} = 2e^t, \quad \tilde{u}|_{x=5} = 0, \quad t \in (0; 8],$
 $\tilde{u}|_{t=0} = \cos 3x, \quad x \in [0; 5].$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2 \sin t, \quad (r, t) \in Q := (0; 2) \times (0; 11],$
 $\lim_{r \rightarrow 0+} u(r, t) < \infty, \quad u(2, t) = 0, \quad t \in (0; 11],$
 $u|_{t=0} = 3r^2, \quad r \in [0; 2].$

Вариант № 13

1. $\tilde{u}_t - 25\tilde{u}_{xx} = x \sin t$, $(x, t) \in Q := (0; 4) \times (0; 10]$,
 $\tilde{u}_x|_{x=0} = 0$, $\tilde{u}|_{x=4} = 2 \sin t$, $t \in (0; 10]$,
 $\tilde{u}|_{t=0} = \cos 3x$, $x \in [0; 4]$.
2. $u_t - 4(u_{rr} + \frac{1}{r}u_r) = 2e^{2t}$, $(r, t) \in Q := (0; 1) \times (0; 9]$,
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty$, $u_r(1, t) = 0$, $t \in (0; 9]$,
 $u|_{t=0} = 3r^2$, $r \in [0; 1]$.

Вариант № 14

1. $\tilde{u}_t - 16\tilde{u}_{xx} = (x + 1)e^{3t}$, $(x, t) \in Q := (0; 6) \times (0; 10]$,
 $\tilde{u}_x|_{x=0} = 2e^{3t}$, $\tilde{u}|_{x=6} = 0$, $t \in (0; 10]$,
 $\tilde{u}|_{t=0} = \sin 3x$, $x \in [0; 6]$.
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2r^2 \cos 3t$, $(r, t) \in Q := (0; 4) \times (0; 11]$,
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty$, $u(4, t) = 0$, $t \in (0; 11]$,
 $u|_{t=0} = 5$, $r \in [0; 4]$.

Вариант № 15

1. $\tilde{u}_t - 4\tilde{u}_{xx} = 2x \sin 3t$, $(x, t) \in Q := (0; 3) \times (0; 14]$,
 $\tilde{u}|_{x=0} = 0$, $\tilde{u}_x|_{x=3} = 2 \sin 3t$, $t \in (0; 14]$,
 $\tilde{u}|_{t=0} = \cos 4x$, $x \in [0; 3]$.
2. $u_t - 4(u_{rr} + \frac{1}{r}u_r) = 2r^2t$, $(r, t) \in Q := (0; 8) \times (0; 9]$,
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty$, $u_r(8, t) = 0$, $t \in (0; 9]$,
 $u|_{t=0} = 3$, $r \in [0; 8]$.

Вариант № 16

1. $\tilde{u}_t - 36\tilde{u}_{xx} = (2x + 1)e^{5t}$, $(x, t) \in Q := (0; 3) \times (0; 15]$,
 $\tilde{u}_x|_{x=0} = 2e^{5t}$, $\tilde{u}|_{x=3} = 0$, $t \in (0; 15]$,
 $\tilde{u}|_{t=0} = \sin 4x$, $x \in [0; 3]$.
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2r^2t$, $(r, t) \in Q := (0; 5) \times (0; 11]$,
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty$, $u(5, t) = 0$, $t \in (0; 11]$,
 $u|_{t=0} = 5$, $r \in [0; 5]$.

Вариант № 17

1. $\tilde{u}_t - \tilde{u}_{xx} = 3x \sin 6t, \quad (x, t) \in Q := (0; 4) \times (0; 15],$
 $\tilde{u}_x|_{x=0} = 0, \quad \tilde{u}|_{x=4} = 2 \sin 6t, \quad t \in (0; 15],$
 $\tilde{u}|_{t=0} = \cos 4x, \quad x \in [0; 4].$
2. $u_t - 4(u_{rr} + \frac{1}{r}u_r) = 2r^2 e^{2t}, \quad (r, t) \in Q := (0; 9) \times (0; 10],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u(9, t) = 0, \quad t \in (0; 10],$
 $u|_{t=0} = 4, \quad r \in [0; 9].$

Вариант № 18

1. $\tilde{u}_t - 4\tilde{u}_{xx} = (2x + 1)e^{5t}, \quad (x, t) \in Q := (0; 5) \times (0; 16],$
 $\tilde{u}|_{x=0} = 2e^{5t}, \quad \tilde{u}|_{x=5} = 0, \quad t \in (0; 16],$
 $\tilde{u}|_{t=0} = \sin 5x, \quad x \in [0; 5],$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 2r^2 e^{8t}, \quad (r, t) \in Q := (0; 4) \times (0; 16],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u(4, t) = 0, \quad t \in (0; 16],$
 $u|_{t=0} = 6, \quad r \in [0; 4].$

Вариант № 19

1. $\tilde{u}_t - 9\tilde{u}_{xx} = 4x \sin 8t, \quad (x, t) \in Q := (0; 3) \times (0; 17],$
 $\tilde{u}|_{x=0} = 0, \quad \tilde{u}_x|_{x=3} = 2 \sin 8t, \quad t \in (0; 17],$
 $\tilde{u}|_{t=0} = \sin 4x, \quad x \in [0; 3].$
2. $u_t - 16(u_{rr} + \frac{1}{r}u_r) = 2e^{4t}, \quad (r, t) \in Q := (0; 5) \times (0; 10],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u(5, t) = 0, \quad t \in (0; 10],$
 $u|_{t=0} = 5r^2, \quad r \in [0; 5].$

Вариант № 20

1. $\tilde{u}_t - 9\tilde{u}_{xx} = 3xe^{5t}, \quad (x, t) \in Q := (0; 3) \times (0; 18],$
 $\tilde{u}|_{x=0} = 2e^{5t}, \quad \tilde{u}|_{x=3} = 0, \quad t \in (0; 18],$
 $\tilde{u}|_{t=0} = 2 \sin 6x, \quad x \in [0; 3].$
2. $u_t - a^2(u_{rr} + \frac{1}{r}u_r) = 4r^2 e^{2t}, \quad (r, t) \in Q := (0; 9) \times (0; 16],$
 $\lim_{r \rightarrow 0^+} u(r, t) < \infty, \quad u_r(9, t) = 0, \quad t \in (0; 16],$
 $u|_{t=0} = 2, \quad r \in [0; 9].$