Ústav Aplikovanej Mechaniky a Mechatroniky
Strojnícka fakulta STU v Bratislave

ZADANIE č. 1

Laplaceova transformácia a odozva systému

Meno a Priezvisko:
Krúžok:

Zadanie č. 1

ZADANIE:

Uvažujte **diferenciálnu rovnicu** podľa Vášho variantu zadania a riešte túto zadanú diferenciálnu rovnicu metódami Laplaceovej transformácie.

Nájdite všeobecné riešenie danej diferenciálnej rovnice časovo závislej funkcie **y(t)** s uvažovaním **počiatočných podmienok** a **budiacej funkcie u(t)** podľa špecifikácie zadania.

Riešenie odozvy danej DR a budiacej funkcie zobrazte na príslušných grafov. K riešeniu je možné využiť Matlabovské príkazy a slovník Laplaceových funkcií.

VARIANTY ZADANÍ

1. $3\dddot{y}(t) + 21\ddot{y}(t) + 42\dot{y}(t) + 24y(t) = 3u(t)$, $\ddot{y}(0) = 2$, $\dot{y}(0) = y(0) = -1$, kde $u(t) = 2$

2. $12\ddot{y}(t) + 45\dot{y}(t) + 10y(t) = u(t)$, $\dot{y}(0) = -2$, $y(0) = 0$, kde $u(t) = 3$

3. $\dddot{y}(t) + 2\ddot{y}(t) - 4\dot{y}(t) + 8y(t) = u(t)$, $\ddot{y}(0) = \dot{y}(0) = y(0) = 0$, kde $u(t) = \sin(3t)$

4. $2\ddot{y}(t) + 12\ddot{y}(t) + 18y(t) = 4u(t)$, $\ddot{y}(0) = -1$, $\dot{y}(0) = 0$, $y(0) = -2$, kde $u(t) = \cos(6t)$

5. $\dddot{y}(t) + 15\ddot{y}(t) + 10\dot{y}(t) - 5y(t) = 10u(t)$, $\ddot{y}(0) = \dot{y}(0) = y(0) = 0$, kde $u(t) = t$

6. $-\dddot{y}(t) + 9\ddot{y}(t) + 12\dot{y}(t) - 18y(t) = -u(t)$, $\ddot{y}(0) = -3$, $\dot{y}(0) = -2, y(0) = 0$, kde $u(t) = 5$

7. $\dddot{y}(t) + 21\ddot{y}(t) + 42\dot{y}(t) + 24y(t) = u(t)$, $\ddot{y}(0) = \dot{y}(0) = y(0) = 0$, kde $u(t) = \sin(2t) + \cos(3t)$

8. $4\ddot{y}(t) + 16\dot{y}(t) + 16y(t) = 4u(t)$, $\dot{y}(0) = y(0) = 0$, kde $u(t) = te^{-4t}$

9. $3\ddot{y}(t) + 9\dot{y}(t) + 18y(t) = 3u(t)$, $\dot{y}(0) = y(0) = -1$, kde $u(t) = te^{-2t}$

10. $0.5\dddot{y}(t) + \ddot{y}(t) + 8\dot{y}(t) + 16y(t) = 0.5u(t)$, $\ddot{y}(0) = \dot{y}(0) = y(0) = -1$, kde $u(t) = 2$

11. $30\dddot{y}(t) + 15\ddot{y}(t) + 300\dot{y}(t) + 30y(t) = 30u(t)$, $\ddot{y}(0) = \dot{y}(0) = y(0) = -2$, kde $u(t) = 3t$

12. $\dddot{y}(t) + 15\ddot{y}(t) + 24\dot{y}(t) + 12y(t) = 3u(t)$, $\ddot{y}(0) = -1, \dot{y}(0) = y(0) = 2$, kde $u(t) = 4$

13. $\dddot{y}(t) + 15\ddot{y}(t) + 42\dot{y}(t) + 24y(t) = 3u(t)$, $\ddot{y}(0) = \dot{y}(0) = y(0) = 0$, kde $u(t) = 4t$

14. $4\ddot{y}(t) + 16\dot{y}(t) + 16y(t) = 4u(t)$, $\dot{y}(0) = y(0) = 0$, kde $u(t) = 3\cos(2t)$

15. $\ddot{y}(t) + 16\dot{y}(t) + 16y(t) = 4u(t)$, $\dot{y}(0) = -2, y(0) = 5$, kde $u(t) = 8t$

Zadanie č. 1

16. $8\ddot{y}(t) + 16\dot{y}(t) + 16y(t) = 8u(t), \dot{y}(0) = y(0) = -1, \text{ kde } u(t) = sin(2t)$

17. $\dddot{y}(t) - 21\ddot{y}(t) + 42\dot{y}(t) - 18y(t) = 3u(t), \ddot{y}(0) = \dot{y}(0) = y(0) = 0, \text{ kde } u(t) = te^{-4t}$

18. $5\dddot{y}(t) - 25\ddot{y}(t) + 5\dot{y}(t) - 15y(t) = 20u(t), \ddot{y}(0) = \dot{y}(0) = y(0) = 0, \text{ kde } u(t) = 3sin(5t)$

19. $2\ddot{y}(t) - 16\dot{y}(t) + 8y(t) = 2u(t), \dot{y}(0) = -3, y(0) = -1, \text{ kde } u(t) = 2$

20. $\dddot{y}(t) - 4\ddot{y}(t) + 80\dot{y}(t) + 100y(t) = 10u(t), \ddot{y}(0) = 1, \dot{y}(0) = -2, y(0) = 0, \text{ kde } u(t) = 6t$

21. $0.5\ddot{y}(t) + 20\dot{y}(t) + 16y(t) = 0.5u(t), \dot{y}(0) = y(0) = -2, \text{ kde } u(t) = 5$

22. $0.25\dddot{y}(t) + 16\ddot{y}(t) + 108\dot{y}(t) + 10y(t) = 0.25u(t), \ddot{y}(0) = 1, \dot{y}(0) = -2, y(0) = 2, \text{ kde}$

$u(t) = 2t$

23. $3\ddot{y}(t) + 18\dot{y}(t) + 27y(t) = 3u(t), \dot{y}(0) = y(0) = 0, \text{ kde } u(t) = te^{-2t}$

24. $3\ddot{y}(t) - 27y(t) = 3u(t), \dot{y}(0) = -1, y(0) = 2, \text{ kde } u(t) = 4cos(2t)$

25. $4\ddot{y}(t) + 18\dot{y}(t) = -4u(t), \dot{y}(0) = 3, y(0) = -1, \text{ kde } u(t) = te^{-3t}$

26. $\dddot{y}(t) - 15\ddot{y}(t) + 80y(t) = 3u(t), \ddot{y}(0) = 1, \dot{y}(0) = 2, y(0) = -5, \text{ kde } u(t) = 1$

27. $-3\dddot{y}(t) + 21\ddot{y}(t) - 15\dot{y}(t) + 30y(t) = 3u(t), \ddot{y}(0) = -1, \dot{y}(0) = -5, y(0) = 10, \text{ kde}$

$u(t) = 20$

28. $5\dddot{y}(t) + 25\ddot{y}(t) + 125\dot{y}(t) = 20u(t), \ddot{y}(0) = -1, \dot{y}(0) = -5, y(0) = 10, \text{ kde } u(t) = 5$

29. $-\dddot{y}(t) + 12\ddot{y}(t) + 16\dot{y}(t) + 24y(t) = -3u(t), \ddot{y}(0) = \dot{y}(0) = y(0) = 0, \text{ kde } u(t) = sin(3t)$

30. $\dddot{y}(t) + 3\ddot{y}(t) - 2\dot{y}(t) + 10y(t) = 6u(t), \ddot{y}(0) = -2, \dot{y}(0) = 2, y(0) = 4, \text{ kde } u(t) = 10$

31. $3\dddot{y}(t) + 9\ddot{y}(t) - 3\dot{y}(t) + 18y(t) = 3u(t), \ddot{y}(0) = \dot{y}(0) = y(0) = 0, \text{ kde } u(t) = 4te^{-4t}$

32. $\ddot{y}(t) + 18\dot{y}(t) + 27y(t) = 2u(t), \dot{y}(0) = -5, y(0) = 10, \text{ kde } u(t) = 3$

33. $\dddot{y}(t) - 5\ddot{y}(t) + 20\dot{y}(t) + 100y(t) = 5u(t), \ddot{y}(0) = \dot{y}(0) = y(0) = 0, \text{ kde } u(t) = sin(9t)$

34. $\ddot{y}(t) - 18\dot{y}(t) + 27y(t) = 3u(t), \dot{y}(0) = 2, y(0) = 10, \text{ kde } u(t) = 20$