ÇANKAYA UNIVERSITY

Department of Mathematics

MATH 254 - Introduction to Differential Equations

FINAL EXAMINATION
13.01.2022

Question	Grade	Out of
1		20
2		20
3		20
4		20
5		20
Total		100

STUDENT NUMBER:

NAME-SURNAME:

SIGNATURE:

INSTRUCTOR:

DURATION: 100 minutes

IMPORTANT NOTES:

1) Please make sure that you have written your student number and name above.

2) Check that the exam paper contains 5 problems.

3) Show all your work. No points will be given to correct answers without reasonable work.

1) The solution of the initial-value problem $y' = 2y, y(0) = 1$ is also a solution of $\frac{x}{2}y'' - (x+1)y' + 2y = 0$. Then find a general solution to $\frac{x}{2}y'' - (x+1)y' + 2y = 0$.

2) Solve the initial-value problem $y''' = 3u(x - 2), y(0) = 1, y'(0) = -1, y''(0) = 0.$

3) Solve the initial-value problem $y'(x) - \int_0^x (x-v)e^{(x-v)} \, dv = 1, y(0) = 1.$

4) Find only first 4 nonzero terms of the series solution of the initial-value problem $y'' - x^2 y = 0, y(0) = 1, y'(0) = 2.$

5) Solve the problem $u_t = u_{xx}, 0 < x < 1, t > 0, u(0,t) = u(1,t) = 0, u(x,0) = \begin{cases} 1, & 0 < x < \frac{1}{2}, \\ x, & \frac{1}{2} < x < 1. \end{cases}$