FINAL EXAMINATION

Prof. N. Haidar FACULTY OF ARTS & SCIENCES, A.U.B.

Math. 202 Jan.,27,1996

Time: 2 hours. (1st Semester, 1995-96) (closed book)

I. Solve the DE: $y' = (x\cos y + \sin 2y)^{-1}$

II. Solve the DE: $xy' + y = y^2 \ln x$

III. Determine the values of λ for which the BVP

$$y'' + \lambda^2 y = 0 \; ; \; y'(0) = y'(\pi) = 0.$$

has nontrivial solutions.

IV. Solve the IVP

$$y''' - 8y = 0 \; ; \; y(0)=0, y'(0)=-1, y''(0)=0.$$

V. Solve the DE: $y'' - 2y' + 2y = e^x \tan x$

VI. Apply the method of Frobenius to solve $x^2 y'' + x(x-1)y' + y = 0$

VII. Solve the DE: $x^2 y'' + 3x y' + 4y = 5$.

IIX. Solve the IVP

$$y'' + y = U(t) - 2U(t-1) + U(t-2) \; ; \; y(0) = y'(0) = 0.$$

IX. Solve only for $z(t)$ the system of integral equations

$$\begin{cases} y(t) = t + \int_0^t e^{-(t-u)} y(u)\, du + \int_0^t (t-v) z(v)\, dv \\ z(t) = 1 + \int_0^t \sinh(t-v)\, y(v)\, dv - \int_0^t e^{(t-u)} z(u)\, du \end{cases}$$

X. Find the eigen-expansion solution vector of

$$x' = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix} x$$

36.