Post graduate Exam (Basic Engineering Sciences)
Branch: Engineering Mathematics (Master 600)

Menofia University Faculty of Engineering Academic Year: 2016-2017 Department: Basic Eng. Sci.	Minoufia University	Subject: Integral Equations Code: BES 625 Time Allowed: 3 hours Date: 14 / 1 / 2017 Max Marks: 100

Answer all the following questions:

Q.1

(A) State whether of the following integral equations are (Voletra IE or Fredholm IE), (First kind or Second kind), (homogenous or non-homogenous):

$$\bullet\ f(x)=\int_a^b k(x,s)\phi(s)ds \qquad \bullet\ \phi(x)=\sin(x)+\lambda\int_0^{\pi/2}\cos(x^2s)\phi(s)ds$$

(B) Using the recursion series method solve the following IE.

$$\phi(x)=x+\lambda\int_0^x \phi(s)ds$$

(C) Find the first two terms of the Neumann series for the equation:

$$\phi(x)=\sin(x)+\lambda\int_0^{\pi/2}\cos(x^2s)\phi(s)ds$$

(D) Solve the following equations using degenerate kernels method:

$$\phi(x)=x^2+\lambda\int_0^1 x^3s^2\phi(s)ds$$

(E) Find the I.V.P of $u''(y)+yu'(y)+2u(y)=0$ Subject to $u(0)=\alpha$, $u'(0)=\beta$, as a voletra IE?

[Q.1 (50 mark)]

Q.2

(A) Consider the IE $f(x)=g(x)+\lambda\int_0^{\pi}\sin(x-y)f(y)dy$ Find:

1) The values of (λ) for which it has a unique solution.
2) The solution in this case
3) The resolvent kernel
4) The values of (λ) for which the solution is not unique.

(B) Write the Voletra IE for the following O.D.E.

$$y''+\omega^2 y=0\ ,\quad y(0)=0\ ,\ y'(0)=1$$

(C) Using the resolvent kernel method to solve the following IE.

$$g(x)=\cos(2x)+\int_0^{2\pi}\sin(x)\cos(s)g(s)ds$$

(D) Convert the following IE into (O.D.E) and solve it:

$$g(x)=\sin(x)+\int_0^x \sin(x-s)g(s)ds$$

[Q.2 (50 mark)]

Good luck

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