KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

Department of Mathematics & Statistics

Math 401  Methods of Applied Mathematics II

Mid Term Exam 2  Term 142

Time Allowed 2 Hours

Name ___________________________  ID # _______

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Important Note

Write clearly and show all work.

Instructor: F. D. Zaman
Q1) using the distributional definitions, show that

(i) \( H'(x) = \delta(x) \)

(ii) \( |x|' = H(x) - H(-x) \)

(iii) \( \delta(\sin x) = \sum_{0}^{\infty} \delta(x - n\pi) \)
Q2) Solve the Fredholm integral equations.

(i) \[ \int_{a}^{b} k(x, y)u(y)dy = \lambda u \]
\[ k(x, y) = k(y, x) \]

(ii) \[ u(x) = x + \frac{1}{2} \int_{-1}^{1} (t - x)u(t)dt \]
Q 3) Write the given integral equation as a Volterra integral equation of second kind and then solve by iteration

\[ \int_{0}^{x} e^{x-y} u(y) dy = e^{-x} \]
Q4) Write the following boundary value problem as a Fredholm integral equation

\[ u'' + \lambda u = 0, \quad 0 < x < l \]
\[ u(0) = 0, \ u(l) = 0. \]