King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math-513 Semester-142 QUIZ II

NAME: S.No. ID:

Maximum Marks: 20 Section: Time Allowed: 45 minutes

(1) Find the first three non-zero terms in the Fourier-Legendre expansion of

$$f(x) = \begin{cases} 0 & -1 < x < 0 \\ 1 & 0 \leq x < 1. \end{cases}$$

(2) Show that $y_1(x) = x^3$ and $y_2(x) = x^2 + 1$ are orthogonal on $[-1, 1]$. Find values a and b such that both $y_1(x)$ and $y_2(x)$ are othogonal to $y_3(x) = ax + bx^2 + x^3$.

(3) Find the eigenvalues and eigenfunctions of the boundary value problem :

$$y'' + y' + \lambda y = 0; \quad y(0) = 0, y(2) = 0.$$