King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math605-01 / Instructor: Prof. Bilal Chanane
$_x$Major Exam II Duration 2hrs

Name:.....ID:.....

Question	**Points**	**Mark**
1	**30**	
2	**30**	
3	**40**	
Total	**100**	

Exercise 1 *Use the WKB method to find asymptotic approximations of the eigenvalues μ^2 and corresponding eigenfunctions for large values of μ^2 for the following eigenvalue problem*

$$\begin{cases} -\frac{d^2y}{dx^2} = \mu^2 xy, \ 0 < x < 1 \\ \lim_{x\to 0_+} y(x) = 0 \ , \ y(1) = 0 \end{cases}$$

Exercise 2 *Find the asymptotic solution of*

$$\begin{cases} y'' + y' + \epsilon y^2 = 0 \ , \ x > 0 \\ y(0) = 1 \ , \ y'(0) = 0 \end{cases}$$

where ϵ is a small parameter.

Exercise 3 *Use the method of stationary phase to obtain the leading asymptotic behaviour as* $x \to \infty$ *of*

$$g(x) = \int_0^1 \exp\left(ix\left\{t - \sin t\right\}\right) dt$$