KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

Department of Mathematical Sciences

Math 301   Method of Applied Mathematics

Major Exam # 2   Term 061

Time Allowed 90 minutes

Name _____   ID # _____ Section # _____

Q #	Grade
1	/ 4
2	/ 4
3	/ 4
4	/4
5	/4
Total	/ 20

Important Note

Show all work.
Use of programmable calculator is not allowed.
Mobiles and paging devices should not be carried during examination.

Instructor: F. D. Zaman

Q # 1 Find the Laplace transform of the following.

(a) $f(t) = \begin{cases} \pi - t, & 0 < t < \pi \\ 0 & ,\pi \le t < 2\pi \end{cases}$

$f(t)$ is periodic: $f(t + 2\pi) = f(t)$

(b) $f(t) = t\left\{\int_0^t \tau e^{-\tau} d\tau\right\}$

Q2) Find the inverse Laplace transform

(a) $F(s) = \dfrac{1}{s^2}\left(\dfrac{s-3}{s^2+9}\right)$

(b) $F(s) = \dfrac{s}{\left(s^2+4\right)^2}$

Q 3) Solve the following initial value problem

$$y'' + 3y' + 2y = 1 - u(t-1)$$

$$y(0) = 0, \ y'(0) = 1.$$

Q4) Find the Fourier series in $-\pi < x < \pi$

$$f(x) = \begin{cases} 0, -\pi < x < 0 \\ e^x, 0 \leq x < \pi \end{cases}$$

Q 5) Find the eigenvalues and eigenfunctions of the problem
$$x^2 y'' + xy' + \lambda y = 0, \ y(1) = 0, \ y(3) = 0.$$