國立勤益科技大學 100 學年度研究所碩士班招生筆試試題卷

所別：機械工程研究所　　組別：

科目：工程數學

准考證號碼：□□□□□□□□□（考生自填）

考生注意事項：	
1. 考試時間 100 分鐘	3. 請依序做答於答案卷。
2. 可用無程試之計算器	4. 每題各 10%，共十題。

1 Solve the equation $xy' + 2y = e^x$, $y(1) = 0$,

(a) the general solution

(b) the particular solution?

2. Solve the equation (using the separating variables method)

$y' + \frac{1}{x}y^2 = xy^2, y(1) = 1$ (a) the general solution (b) the particular solution.

3. Find the solution of the following equation by the method of Laplace transform

$y'' + 2y' + y = te^{-t}$, $y(0) = 1$, $y'(0) = -2$

4. Find the solution of the following equation by the method of Laplace transform

$y'' - y = t$, $y(0) = 1$, $y'(0) = 1$

5. If $A = \begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$ find

(a) the inverse of A ? (b) the addition of A and B .

6. The matrix A find

(a) Eigen-values ?

(b) Eigen-vector of matrix A. ?

$$A = \begin{bmatrix} -2 & -2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

7. Evaluate the integral $\int_C \nabla\phi \bullet d\vec{r}$, where $\phi(x,y,z)$ function is $\phi(x,y,z) = xy + yz + xz$, and the path $c: x = \cos(t),\ y = \sin(t),\ z = t,\ 0 \le t \le \pi$.

8. Evaluate the integral $\iint_S \vec{F} \cdot d\vec{A}$, where the surface is

$S:\ x^2 + y^2 + (z-1)^2 = 9,\ 1 \le z \le 4,\ z = 1$ and

$\vec{F} = [x,\ y,\ z-1]$

9. Solve the Eigen value problems $y'' + \lambda y = 0,\ y(0) = 0,\ y(L) = 0$
   (a) the Eigen values.
   (b) the Eigen functions.

10. The time function is $f(t) = 1,\ 0 \le t \le \pi$.
   (a) Expand in Fourier sine series.
   (b) Sketch the function.