國立高雄第一科技大學 97 學年度 碩士班 招生考試　試題紙

系 所 別：光電工程研究所　　組　別：甲、乙組

考科代碼：2211、2221　　考　科：工程數學

注意事項：

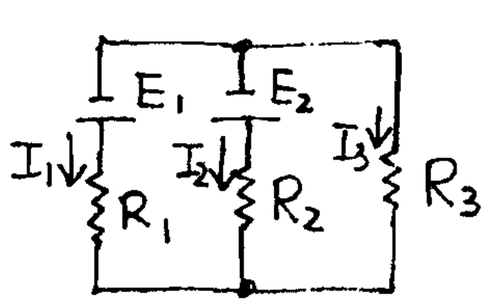
1、本科目可使用本校提供之電子計算器。

2、請於答案卷上規定之範圍作答，違者該題不予計分。

1. (10%) Use Residue Theorem to evaluate $\int_0^{2\pi} \frac{1}{(2+Sin\theta)^2}\, d\theta$

2. (12%) Given the flow $f(z)=(1-i)Z$, please compute the circulation around, and the net flux across the circle $C:|z|=2$

3. (10%)Please use the Cramer's rule to find out the Current I_3 in the circuit



4. (12%) Expand the function $f(x)=x^2$, 0 < x <1, in a Fourier-Bessel series

$f(x)=\sum_{i=1}^{\infty} c_i J_2(\alpha_i x)$, with $J_2(\alpha)=0$.

5. (10%) Find the eigenvalues and eigenvectors of the matrix $\begin{pmatrix} 2 & -1 & 0 \\ 5 & 2 & 4 \\ 0 & 1 & 2 \end{pmatrix}$

6. (12%) Given $f(x)=e^{-x}\cos x$, x > 0, find its Fourier cosine and sine integral representation.

7. (12%) $f(z)=\frac{1}{2+z}$, please expand the given function in the Taylor series centered at $z_0=-1$ and $z_0=i$, also find the region within which both series converge.

8. (10%) Evaluate the line integral $\oint_C \frac{-y^3}{(x^2+y^2)^2}dx + \frac{xy^2}{(x^2+y^2)^2}dy$, where C is the square with vertices (2,2), (-2,2), (-2,-2), (2,-2) in a counterclockwise direction.

9. (12%) A point charge q located at the origin create the electric field at the point (x,y,z) $E = q\frac{r}{\|r\|^3}$, where r = xi + yj + zk. Please find the outward flux of electric field E through a cubic formed by $x = y = z = \pm a$ six planes.