※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。
只有答案，沒有計算過程或說明原因，也不予計分。

1. (10%) Please find $\mathscr{L}^{-1}\{\dfrac{(1+e^{-2s})^2}{s+2}\} = ?$

2. (15%) Please find the integration factor I for the non-exact differential eq. $\cos x(e^{2y} - y)\dfrac{dy}{dx} = e^y \sin 2x$

3. (10%) Please find the general solution for $y''(x) + 9y(x) = 0.25\csc 3x$

4. (10%) Please find $\mathscr{L}^{-1}\{\dfrac{ks}{(s^2+k^2)^2}\} = ?$

5. (10%) Please solve $y^{(4)} + 5y^{(2)} + 4y = \cos(3x+3) + \sin(4x+1)$

6. (20%) Please find the column space C(A), nullspace N(A), row space C(A^T), and left nullspace N(A^T) of a 3 by 4 matrix A.

$$A = \begin{bmatrix} 1 & 2 & 2 & 5 \\ 1 & 2 & 3 & 7 \\ 1 & 2 & 4 & 9 \end{bmatrix}$$

7. (10%) Let A be a matrix and I an identify matrix. If A^r-I=0, for r>1, please find that A^{-1}

8. (15%) Constructing an orthogonal matrix for the matrix A

$$A = \begin{bmatrix} 7 & 4 & -4 \\ 4 & -8 & -1 \\ -4 & -1 & -8 \end{bmatrix}$$