

明新科技大學 92 學年度研究所 一般生 在職生 招生入學考試命題紙 (一)

科目	考試日期	節次	准考證號碼
工程數學	92年5月11日	第1節	

請依序作答, 否則不與記分

1. (1) Find the eigenvalues of matrix A , and (2) find their eigenvectors. (10%).

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

2. (1) Find the reduced form of matrix B (3%), (2) find its rank (3%), and (3) find a basis for the row space of the matrix (4%).

$$B = \begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & -1 \\ 0 & 0 & 2 \end{bmatrix}$$

3. If Fourier transformation $\mathfrak{F}\{f(t)\} = F(\omega)$ and t_0 is any real number, prove

$$\mathfrak{F}\{f(t-t_0)\} = e^{-i\omega t_0} F(\omega). (10\%)$$

4. Find $\mathfrak{F}^{-1} \left\{ \frac{e^{(2\omega-4)i}}{2-(2-\omega)i} \right\}$ (10%)

5. Find the volume of the parallelepiped having incident sides from the first point to each of the other three. (10%)

$$(0,0,0) \quad (-5,1,6) \quad (2,4,6) \quad (-1,0,5)$$

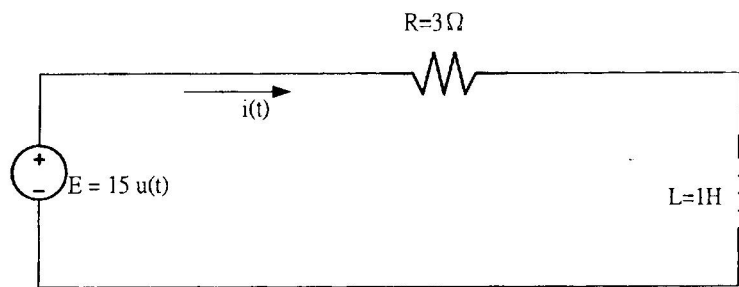
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6. Find a general solution of the following equations :

(1) $y'' - 3y' + 2y = e^{2x}$ (10%)

(2) $xy' = e^{-xy} - y$ (10%)

7. Consider the simple RL circuit shown below with a dc input ($E = 15 \text{ V}$) applied at $t=0$ and an unfluxed inductor. Using Laplace transform techniques, determine the current $i(t)$ for $t \geq 0$. (10%)



8. Solve the following differential equation using Laplace transform techniques :

$$y'' + 5y' + 6y = e^{-2t}$$

given initial conditions $y(0) = y'(0) = 0$. (10%)

9. Evaluate $\oint_C \frac{dz}{z(z^2 + 6z + 4)}$, where C : the circle $|z| = 4$ (counter clockwise direction). (10%)