請附答案卷，准帶計算機　　出題老師：方亮彬

建國科技大學 機械工程系暨製造科技研究所 工程數學 期末考(100 學年上學期)

班級：_____ 學號：_____ 姓名：_____

1. Terminology (18%)

   (1)matrix; (2) column; (3) row; (4)eigen value; (5)eigen vector

   (6)orthogonal matrix; (7)unit vector; (8)dot product; (9) cross product

2. Given $y_1 = \cos 3x$, $y_2 = \sin 3x$, Try to explain that y1and y2 are solution of $y'' + 9y = 0$, and find the general solution(8%)

3. Solve $y'' - 7y' - 18y = 0$ (8%)

4. Solve $y'' + 2y' + 5y = 0$ (8%)

5. Solve $y'' - 2y = x - 1$ with intial condition $y(0) = 2, y'(0) = 0$ (8%)

6. Solve $x^2 y'' - 3xy' + 4y = 0$ (8%)

7. Solve $y''' + 6y'' + 11y' + 6y = 0$ (8%)

8. Given two matrix $\mathbf{A} = \begin{bmatrix} 1 & -3 \\ 2 & 0 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 1 & -3 \\ 2 & 0 \end{bmatrix}$, determind, (a)A+B; (b)A-B; (c)AB; (d)$(AB)^T$ (8%)

9. Given $\mathbf{A} = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 1 & 1 \\ 7 & 2 & -1 \end{bmatrix}$, find $|\mathbf{A}|$ (8%)

10. Given $\mathbf{A} = \begin{bmatrix} 1 & 2 & 4 \\ -1 & 0 & 3 \\ 3 & 1 & 2 \end{bmatrix}$, find $\mathbf{A}^{-1}$(8%)

11. Given $\mathbf{A} = \begin{bmatrix} 5 & 4 \\ 2 & 3 \end{bmatrix}$, find the eigen value and eigen vector of **A**. (8%)

12. Two vectors **u**=**i**+2**j**+a**k** and **B**=3**i**-**j**+2**k**, find a which make the two vector orthogonal each other. (8%)

13. Three vectors **A**=**i**-**k**; **B**=2**i**+**j**; **C**=-**i**+**j**,

    Find: (a) the angle formed by A and B., (b) the value α whick made **A**+α**B** and **C** orhtognal. (8%)

14. Find the volume of parallelepiped formed by the three vectors, **u**=(1, 1, 2), **v**=(2, -3, 5), **w**=(1, 2, 0). (8%)

建國科技大學 100 學年度第一學期 (中. 末) 考試答案卷

科目: 工程數學 班級: 電二甲 學號: 9940150 姓名: 曾宥達

1 (1) 矩陣 (2) 行 (3) 列 (4) 特徵值 (5) 特徵向量.
(6) 正交矩陣 (7) 單位向量 (8) 內積 (9) 外積 +1

2. $y_1' = -3\sin 3x$, $y_1'' = -9\cos 3x$
$y_2' = 3\cos 3x$, $y_2'' = -9\sin 3x$ > 代入原式
$-9\cos 3x + 9\cos 3x = 0$.
$-9\sin 3x + 9\sin 3x = 0$
$y = C_1\cos 3x + C_2\sin 3x$ +8

3
$\lambda^2 - 7\lambda - 18 = 0$.
$(\lambda - 9)(\lambda + 2) = 0$
$\lambda = 9, -2$
$y = C_1 e^{-2x} + C_2 e^{9x}$ +8

4. $\lambda^2 + 2\lambda + 5 = 0$
$\lambda = \frac{-2 \pm \sqrt{4-20}}{2} = -1 \pm 2i$
$y = C_1 e^{-x}[C_1\cos 2x + C_2\sin 2x]$ +4

5.
(1) $\lambda^2 - 2\lambda$
$\lambda = 0, 2$
$y_h = C_1 + C_2 e^{2x}$.
假設 $y_p = Ax + B$.
$y_p' = A$.
$y_p'' = 0$. 代入
$-2Ax + 2B = -x - 1$
$A = -\frac{1}{2}$
$B = -\frac{1}{2}$
$y_p = -\frac{1}{2}x - \frac{1}{2}$
$y = C_1 + C_2 e^{2x} - \frac{1}{2}x - \frac{1}{2}$ +8

6. $r^2 - 4r + 4 = 0$.
$r = 2, 2$ (重根)
$y = C_1 x^2 + C_2 x^2$ +8

7. $\lambda^3 + 6\lambda^2 + 11\lambda + 6 = 0$.
$(\lambda + 2)(\lambda^2 + 4\lambda + 3) = 0$.
$(\lambda + 2)(\lambda + 3)(\lambda + 1) = 0$.
$\lambda = -2, -3, -1$.
$y = C_1 e^{-x} + C_2 e^{-2x} + C_3 e^{-3x}$. +4

8
(a) $A + B = \begin{bmatrix} 2 & -6 \\ 4 & 0 \end{bmatrix}$
(b) $A - B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
(c) $AB = \begin{bmatrix} 5 & 3 \\ 2 & -6 \end{bmatrix}$
(d) $[AB]^T = \begin{bmatrix} 5 & 2 \\ -3 & 6 \end{bmatrix}$ +4

9
$|A| = \begin{vmatrix} 2 & 1 \\ 7 & -1 \end{vmatrix} - 1 \begin{vmatrix} 2 & 3 \\ 7 & 2 \end{vmatrix} = -9 + 17 = 8$.

10
$|A| = \begin{vmatrix} 2 & 4 \\ 1 & 2 \end{vmatrix} - 3\begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix} = 15$.
$A^{-1} = \frac{1}{15}\begin{bmatrix} 12 & 4 & 12 \\ -1 & 0 & 3 \\ -1 & 0 & 3 \end{bmatrix}^T = \frac{1}{15}\begin{bmatrix} 3 & 11 & -1 \\ 0 & -10 & 5 \\ 6 & -7 & 2 \end{bmatrix}^T$
$A^{-1} = \frac{1}{15}\begin{bmatrix} 3 & 0 & 6 \\ 11 & -10 & -7 \\ -1 & 5 & 2 \end{bmatrix}$

11

$$\begin{bmatrix} 5-\lambda & 4 \\ 2 & 3-\lambda \end{bmatrix} = (5-\lambda)(3-\lambda) - 8 = 0.$$

$$\lambda^2 - 8\lambda + 7 = 0.$$

$$\lambda = -7, -1$$

$\lambda = -1$ $\begin{bmatrix} 6 & 4 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ + b

$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\lambda = -7$ $\begin{bmatrix} 12 & 4 \\ 2 & 10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$ C

12

$3 - 2 + 2a = 0.$

$a = -\frac{1}{2}$ + B

13

(a)

$|A||B|\cos\theta$

$=$

(b)

X

14

$\begin{vmatrix} 1 & 1 & 2 \\ 2 & -3 & 5 \\ 1 & 2 & 0 \end{vmatrix} = \begin{vmatrix} 12 \\ -35 \end{vmatrix} - 2 \begin{vmatrix} 1 & 2 \\ 2 & 5 \end{vmatrix}$ 4

$= 15 - 2 = 13.$

建國科技大學 100 學年度第一學期 (中.末) 考試答案卷

科目: 工程數學 班級: 機械二甲 學號: 99401049 姓名: 林建宏

100

1. (1) matrix 矩陣
(2) column 行
(3) row 列
(4) eigen value 特徵值
(5) eigen vector 特徵向量
(6) orthogonal matrix 正交矩陣
(7) unit vector 單位向量
(8) dot product 內積
(9) cross product 外積

+18

2. $y_1 = \cos 3x \quad y_1' = -3\sin 3x \quad y_1'' = -9\cos 3x$

$y_2 = \sin 3x \quad y_2' = 3\cos 3x \quad y_2'' = -9\sin 3x$

$y_1'' + 9y_1 = -9\cos 3x + 9\cos 3x = 0$

$y_2'' + 9y_2 = -9\sin 3x + 9\sin 3x = 0$

$\therefore y = c_1\cos 3x + c_2\sin 3x$ #

+8

3. $y'' - 7y' - 18y = 0$

$\lambda^2 - 7\lambda - 18 = 0$

$(\lambda+2)(\lambda-9)$

$\lambda = -2, 9$

$y = c_1 e^{-2x} + c_2 e^{9x}$ #

+8

4. $y'' + 2y' + 5y = 0$

$\lambda^2 + 2\lambda + 5 = 0$

$\frac{-2\pm\sqrt{4-20}}{2} = \frac{-2\pm\sqrt{16}i}{2}$

$\frac{-2\pm 4i}{2} = -1\pm 2i$

$y = e^{-x}(c_1\cos 2x + c_2\sin 2x)$ #

+8

5. $y'' - 2y = x - 1$

$y = y_h + y_p$

先求齊性解 y_h

$\lambda^2 - 2 = 0$

$\lambda^2 = 2$

$\lambda = \pm\sqrt{2}$

$y_h = c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x}$

+4

待求非齊性解 y_p

$y_p = Ax$

$y_p' = A$

$y_p'' = 0$

代入原式

$-2Ax = x - 1$

$A = -\frac{1}{2}$

$y = y_h + y_p$

$y = c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x} - \frac{1}{2}x$

$y' = \sqrt{2}c_1 e^{\sqrt{2}x} - \sqrt{2}c_2 e^{-\sqrt{2}x} - \frac{1}{2}$

$y(0)\ c_1 + c_2 = 2$

$y'(0) = \sqrt{2}c_1 - \sqrt{2}c_2 - \frac{1}{2} = 0$

$\sqrt{2}c_1 + \sqrt{2}c_2 = 2\sqrt{2}$

$-\sqrt{2}c_1 - \sqrt{2}c_2 = \frac{1}{2}$

$2\sqrt{2}c_2 = 2\sqrt{2} + \frac{1}{2}$

$c_2 = \frac{2\sqrt{2}+\frac{1}{2}}{2\sqrt{2}}$

$-\sqrt{2}c_1 - \sqrt{2}c_2 = -2\sqrt{2}$

$-\sqrt{2}c_1 - \sqrt{2}c_2 = \frac{1}{2}$

$-2\sqrt{2}c_1 \quad -2\sqrt{2} - \frac{1}{2}$

$c_1 = \frac{2\sqrt{2}+\frac{1}{2}}{2\sqrt{2}}$

$y = \frac{2\sqrt{2}+\frac{1}{2}}{2\sqrt{2}} e^{\sqrt{2}x} + \frac{2\sqrt{2}+\frac{1}{2}}{2\sqrt{2}} e^{-\sqrt{2}x} + \frac{1}{2}x$ #

+4

6. $x^2y'' - 3xy' + 4y = 0$

$r(r-1) - 3r + 4 = 0$

$r^2 - r - 3r + 4 = 0$

$r^2 - 4r + 4 = 0$

$(r-2)(r-2)$

$r = 2$

$y = c_1x^2 + c_2\ln^2(x^2)$ #

+8

7. $y''' + 6y'' + 11y' + 6y = 0$

$\lambda^3 + 6\lambda^2 + 11\lambda + 6 = 0$

$(+2)\ 1+4+3$

$1+6+11+6$

$1+2$

$4+11$

$4+8$

$3+6$

$3+6$

0

$(\lambda+2)(\lambda^2+4\lambda+3)$

$(\lambda+2)(\lambda+1)(\lambda+3)$

$\lambda = -2, -1, -3$

$y = c_1e^{-2x} + c_2e^{-x} + c_3e^{-3x}$ #

+8

N: 20

100

8. $A\begin{bmatrix}1 & -3\\ 2 & 0\end{bmatrix}\ B\begin{bmatrix}1 & -3\\ 2 & 0\end{bmatrix}$

(a) $A+B\ \begin{bmatrix}2 & -6\\ 4 & 0\end{bmatrix} = 24$ #

(b) $A-B\ \begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix} = 0$ #

(c) $AB\ \begin{bmatrix}-5 & -3\\ 2 & -6\end{bmatrix} = 36$ #

(D) $(AB)^T\ \begin{bmatrix}-5 & 2\\ -3 & -6\end{bmatrix}$ #

9. $\begin{bmatrix}1 & -2 & +3\\ 2 & 3 & 1\\ 0 & 1 & 1\\ 1 & 2 & -1\end{bmatrix}$

$2\begin{vmatrix}3 & 1\\ 2 & -1\end{vmatrix} - 3\begin{vmatrix}0 & 1\\ 1 & -1\end{vmatrix} + 1\begin{vmatrix}0 & 1\\ 1 & 2\end{vmatrix}$

$-6 + 3 - 1 = -4$ #

+8

10. $\begin{bmatrix}1 & 2 & 4 & 3\\ -1 & 0 & 3 & -1\\ 3 & 1 & 2 & 3\\ -1 & 2 & 4 & -2\\ 0 & 3 & -1 & 0\end{bmatrix}^T$

$A^{-1} = \frac{\text{adj}(A)}{|A|}$

$\begin{bmatrix}-3 & 11 & -1\\ 0 & -10 & 3\\ 6 & -7 & 2\end{bmatrix}^T = \begin{bmatrix}-3 & 0 & 6\\ 11 & -10 & -7\\ -1 & 3 & 2\end{bmatrix}$

+8

$|A| = \begin{bmatrix}1 & 2 & 4\\ -1 & 0 & 3\\ 3 & 1 & 2\end{bmatrix}$

$1\begin{vmatrix}0 & 3\\ 1 & 2\end{vmatrix} - 2\begin{vmatrix}-1 & 3\\ 3 & 2\end{vmatrix} + 4\begin{vmatrix}-1 & 0\\ 3 & 1\end{vmatrix}$

$-3 + 22 - 4 = 15$

$\frac{1}{15}\begin{bmatrix}-3 & 0 & 6\\ 11 & -10 & -7\\ -1 & 5 & 2\end{bmatrix} = \begin{bmatrix}\frac{-3}{15} & 0 & \frac{6}{15}\\ \frac{11}{15} & \frac{-10}{15} & \frac{-7}{15}\\ \frac{-1}{15} & \frac{5}{15} & \frac{2}{15}\end{bmatrix}$ #

+4

11. $\begin{bmatrix} 5-\lambda & 4 \\ 1 & 3-\lambda \end{bmatrix}$

$(5-\lambda)(3-\lambda) = 15-8\lambda+\lambda^2$

$15-8\lambda+\lambda^2-8 = \lambda^2-8\lambda+7$

$\lambda^2-8\lambda+7$

$(\lambda-1)(\lambda-7)$

$\lambda = 1, 7$ 特徵值

$\lambda = 1$

$\begin{bmatrix} 4 & 4 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

$4x_1 + 4x_2 = 0$

$4x_1 = -4x_2$

$x_1 = -x_2$

$x_1 = c$

$x_2 = -c$

$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} c \\ -c \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ 特徵向量

$\lambda = 7$

$\begin{bmatrix} -2 & 4 \\ 1 & -4 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

$-2x_1 + 4x_2 = 0$

$-2x_1 = -4x_2$

$x_1 = 2x_2$

$x_2 = c$

$x_1 = 2c$

$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2c \\ c \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ 特徵向量

+8

12. $\vec{u} = i + 2j + ak \quad \vec{B} = 3i - j + 2k$

$u \cdot B = 3 - 2 + 2a = 0$

$2a = -1$

$a = -\frac{1}{2}$ #

+8

13. $\vec{A} = i - k \quad \vec{B} = 2i + j \quad \vec{C} = -i + j$

(a) $\frac{A \cdot B}{|A||B|} = \frac{2}{\sqrt{2}\sqrt{5}} = \frac{2}{\sqrt{10}}$

$\theta = \cos^{-1}\frac{2}{\sqrt{10}}$

$\theta = 50.8^\circ$ #

+8

(b) $A + \alpha B \perp C$

$(1, 0, -1) + (2\alpha, \alpha, 0)$

$(2\alpha+1, \alpha, -1) \cdot (-1, 1, 0)$

$-2\alpha - 1 + \alpha = 0$

$-\alpha = 1$

$\alpha = -1$ #

-1

14. $u = (1, _, 2) \quad v = (2, _, _)$

$\begin{vmatrix} + & - & + \\ 1 & 1 & 2 \\ 2 & -3 & 5 \\ 1 & 2 & 0 \end{vmatrix}$

$1\begin{vmatrix} -3 & 5 \\ 2 & 0 \end{vmatrix} - \begin{vmatrix} 2 & 5 \\ 1 & 0 \end{vmatrix} + 2\begin{vmatrix} 2 & -3 \\ 1 & 2 \end{vmatrix}$

$-10 + 5 + 14 = 9$ #

+8

建國科技大學100學年度第一學期 (中.末) 考試答案卷

科目:工程數學 班級:木設二甲 學號:99401015 姓名:柯宗盛

1、(1)矩陣 matrix
(2)列 column
(3)行 row
(4)特徵數值 eigen value
(5)特徵向量 eigen vector
(6) orthogonal matrix 正交向量
(7) unit vector 單位向量
(8) dot product 內積(點積)
(9) cross product 外積(叉積)

+10

2、 X

3、$y''-7y'-18=0$

$y''-25y=0$

$y''=25$ X

4、$y''+2y'+5y=0$

$y''+7y'=0$ X

$y''=7$

5、 X

6、 X

7、 X

8、$A=\begin{bmatrix}1 & X & -3\\ 2 & & 0\end{bmatrix}$ $B=\begin{bmatrix}1 & X & -3\\ 2 & & 0\end{bmatrix}$

A= X

9、 X

10、 X N:25

43

11、$A=\begin{bmatrix}5 & X & 4\\ 2 & & 3\end{bmatrix}$

A= -7

12、 X

13、 X

14、 X

建國科技大學 100 學年度第一學期 (中. 末) 考試答案卷

科目: 工程數學 班級: 機械二甲 學號: 9940101016 姓名: 蔡昀修

63

1.
(1) matrix 矩陣
(2) column 行
(3) row 列
(4) eigen value 特徵值
(5) eigen vector 特徵向量
(6) orthogonal matrix 正交矩陣
(7) unit vector 單位向量
(8) dot product 內積
(9) cross product 外積

+18

2. $y''+9y=0$

$\lambda^2+9=0$

$\lambda = 1, 9$

X

3. $y''-7y'-18y=0$

$y_h = C_1e^{\lambda_1 x} + C_2e^{\lambda_2 x}$

$\lambda^2-7\lambda-18=0$

$y_h =$

$\lambda = \frac{-(-7)\pm\sqrt{(-7)^2-4(1)(-18)}}{2}$

$= \frac{7\pm\sqrt{49+72}}{2}$

$= \frac{7\pm\sqrt{121}}{2} = \frac{9\pm11}{2}$

$y_h = C_1e^{\frac{7}{2}x}(C_1e^{\frac{11}{2}x} + C_2e^{\frac{11}{2}x})$

N:20

83

4. $y''+2y'+5y=0$

$\lambda^2+2\lambda+5=0$

$\lambda = \frac{-2\pm\sqrt{2^2-4(1)(5)}}{2}$

$= \frac{-2\pm\sqrt{16\,i}}{2}$

$= \frac{-2\pm4i}{2}$

$= -1\pm2i$

$y_h = C_1e^{-x}(C_1\cos 2x + C_2\sin 2x)$

8. $A=\begin{bmatrix}1 & -3\\ 2 & 0\end{bmatrix}$ $B\begin{bmatrix}1 & -3\\ 2 & 0\end{bmatrix}$

(1) $A+B=\begin{bmatrix}1+1 & -3+-3\\ 2+2 & 0+0\end{bmatrix}=\begin{bmatrix}2 & -6\\ 4 & 0\end{bmatrix}$

(2) $A-B=\begin{bmatrix}1-1 & -3-(-3)\\ 2-2 & 0-0\end{bmatrix}=\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$

(3) $AXB=\begin{bmatrix}1X1 & -3X-3\\ 2X2 & 0X0\end{bmatrix}=\begin{bmatrix}1 & 9\\ 4 & 0\end{bmatrix}$

(4) $(AXB)^T=\begin{bmatrix}1 & 4\\ 9 & 0\end{bmatrix}^T$

9.

$A=\begin{vmatrix}4 & 3 & 1\\ 0 & 1 & 1\\ 1 & 2 & -1\end{vmatrix} = \begin{vmatrix}3 & 1\\ 2 & -1\end{vmatrix} + -1\begin{vmatrix}3 & 1\\ 1 & 2\end{vmatrix} = -5\pm11$

$= -12$

X 0

10.

$A=\begin{vmatrix}1&2&4\\-1&0&3\\3&1&2\end{vmatrix}$

$A^{-1}=\frac{adj(A)}{|A|}$

$|A| = \begin{vmatrix}+&-&+\\ &2&4\\-&0&3\\3&1&2\end{vmatrix}$

$= 1\times\begin{vmatrix}2&4\\1&2\end{vmatrix} - 3\times\begin{vmatrix}2&4\\0&3\end{vmatrix}$

$= 1-18 = -17$

$adj(A) = \begin{vmatrix}+&-&+&-\\ 2&4&1&2\\-&0&3&-1&0\\3&1&2&3&1\\+&2&4&1&2\\-&0&3&-1&0\end{vmatrix}$

$A^{-1} = -\frac{1}{17}\begin{bmatrix}-3&0&6\\11&-10&-7\\-1&5&2\end{bmatrix}$

$= \begin{vmatrix}-3&11&-1\\0&-10&5\\6&-7&2\end{vmatrix}^T$

$= \begin{vmatrix}-3&0&6\\11&-10&-7\\-1&5&2\end{vmatrix}$

11. $A=\begin{vmatrix}5&4\\2&3\end{vmatrix}$

$\begin{vmatrix}5&4\\2&3\end{vmatrix} - \lambda\begin{vmatrix}1&0\\0&1\end{vmatrix}$

$= \begin{vmatrix}5-\lambda&4\\2&3-\lambda\end{vmatrix}$

$\Rightarrow (5-\lambda)(3-\lambda)-8=0$

$\lambda^2-8\lambda+15=0$

$\lambda = -3, -5$

(-3) 代 λ

$\begin{vmatrix}5-(-3)&4\\2&3-(-3)\end{vmatrix}$

$= \begin{vmatrix}8&4\\2&6\end{vmatrix}$

(-5) 代 λ

$\begin{vmatrix}5-(-5)&4\\2&3-(-5)\end{vmatrix}$

$= \begin{vmatrix}10&4\\2&8\end{vmatrix}$

12.

$u\perp B = (i+2j+ak)(3i-j+2k)$

$= 3-2+2a$

$= 1+2a=0$

$a=\frac{1}{2}$

13. $A=i+k \quad B=2i+j \quad C=-i+j$

$A\times B = |A\times B|\cos\theta$

$(1-1)(2+1) = \sqrt{1^2+0^2}\times\sqrt{2^2+1^2}\times\cos\theta$

$(0)(3) = \sqrt{2}\times\sqrt{5}$

$0 = \sqrt{10}\times\cos\theta$

$\theta = \cos^{-1}\sqrt{10}$

$= \cos^{-1}3.16$

建國科技大學 100 學年度第一學期 (中. 末) 考試答案卷

科目: 工程數學 班級: 機械二甲 學號: 9940013 姓名: 黃弘源 60

1. (1) matrix: 矩陣 (2) column: 行 (3) row: 列 (4) eigen value: 特徵值 (5) eigen vector: 特徵向量
(6) orthogonal matrix: 正交矩陣 (7) unit vector: 單位向量 (8) dot product: 內積 (9) cross product: 外積 +18

2. X

3. $\lambda^2 - 7\lambda - 18 = 0$
$(\lambda - 9)(\lambda + 2) = 0$
$y_h = C_1 e^{9x} + C_2 e^{-2x}$ ✓

4. $\lambda^2 + 2\lambda + 5 = 0$
$\lambda = \frac{-1 \pm \sqrt{4 - 4 \cdot 5}}{2}$
$= -1 \pm 2i$
$y_h = e^{-x}(C_1 \cos(2x) + C_2 \sin(2x))$ ✓

5. X
X

6.

7. $\lambda^3 + 6\lambda^2 + 11\lambda + 6 = 0$
$(\lambda + 3)(\lambda^2 + 3\lambda + 2) = 0$
$(\lambda + 3)(\lambda + 1)(\lambda + 2) = 0$
$y_h = C_1 e^{-3x} + C_2 e^{-x} + C_3 e^{-2x}$ ✓

8. (a) $A + B = \begin{bmatrix} 2 & -6 \\ 4 & 0 \end{bmatrix}$
(b) $A - B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
(c) $AB = \begin{bmatrix} -5 & -3 \\ 2 & -6 \end{bmatrix}$ ✓
(d) $(AB)^T = \begin{bmatrix} -5 & 2 \\ -3 & -6 \end{bmatrix}$

9. $|A| = 0 \cdot \begin{vmatrix} 3 & 1 \\ 2 & -1 \end{vmatrix} + 1 \cdot \begin{vmatrix} 2 & 1 \\ 3 & -1 \end{vmatrix} - 1 \cdot \begin{vmatrix} 2 & 3 \\ 3 & 2 \end{vmatrix}$
$= -9 + 17$
$= 8$ ✓

10. X

11. X

12. $\vec{u} \times \vec{B} = (i + 2j + ak)(3i - j + 2k)$
X

13. $\vec{A} \cdot \vec{B} = |A||B| \cdot \cos 60$ ✓

14.

建國科技大學 100 學年度第 一學期 (中.(末)) 考試答案卷

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1、(1). matrix：矩陣
(2). column：行
(3). row：列
(4). eigen value：特徵值
(5). eigen vector：特徵向量
(6). orthogonal matrix：正交矩陣
(7). unit vector：單位向量
(8). dot product：內積
(9). cross product：外積

+18

2、

3、

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9. $|A| = \begin{bmatrix} 2 & 0 & 7 \\ 3 & 1 & 2 \\ 1 & 1 & -1 \end{bmatrix}$

10. $A^{-1} = \begin{bmatrix} 1 & -1 & 3 \\ 2 & 0 & 1 \\ 4 & 3 & 2 \end{bmatrix}$

11. $\begin{bmatrix} 5 & 2 \\ 4 & 3 \end{bmatrix}$

12.

13.

14.

N=20

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