(1) [5+2 marks] **(i)** Find the g
Elimination Process:

$$\begin{cases} x_1 - x_2 + x_3 = 9 \\ 2x_1 - 2x_2 + 3x_3 - 2x_4 = \\ 4x_1 - 4x_2 + 3x_3 + 2x_4 = \\ -4x_1 + 4x_2 + 3x_3 - 14x \end{cases}$$

(ii) Find the particular sol

(i)

$$\begin{pmatrix} \textcircled{1} & -1 & 1 & 0 \\ 2 & -2 & 3 & -2 \\ 4 & -4 & 3 & 2 \\ -4 & 4 & 3 & -14 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -1 & 1 & 0 \\ 0 & 0 & \textcircled{1} & -2 \\ 0 & 0 & -1 & 2 \\ 0 & 0 & 7 & -14 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -1 & 0 & 2 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

The system is con

variables (x_1, x_3)

$\Rightarrow$ General s

(ii)

$x_2 = -3 \longrightarrow$

$x_1 = 1 \longrightarrow$ (

$\longrightarrow (x_1, x_2, x_3,$

[redacted]

(3) [4 mar
(exactl

$$\begin{cases} -x_1 \\ -2x \\ 3x_1 \end{cases}$$

$$\begin{pmatrix} -1 & 4 & -2 \\ -2 & 10 & 2p \\ 3 & -11 & p^2+ \end{pmatrix}$$

$p^2 - p = 0 \longrightarrow$

(i) If $p = 1$

(ii) If $p \neq 0, 1$
$(p^2 - p \neq 0$

(iii) $p = 0 \longrightarrow$

(4) [4 marks]

$\longrightarrow$ $5M +$

$\longrightarrow$ $5M =$

$\longrightarrow$ $M = \frac{1}{5}$

(5) [4 marks]

$$\begin{pmatrix} 1 & 2 & 0 \\ -1 & -2 & 1 \\ 0 & 3 & 0 \end{pmatrix} \xrightarrow{①} \begin{pmatrix}$$

$$\xrightarrow{④} \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{pmatrix}$$

Since $E_4 E_3 E$

we have

$$M^{-1} = E_4$$

(There are oth

(6) [3+3 marks]
possible, *th*

$$\rightarrow \frac{1}{2}(C^T)^{-1} A^{-1} (A^T)^{-1}$$

$$\rightarrow \frac{1}{2}\underbrace{(C^T)^{-1} C^T}_{I} B$$

(ii) Now solv

$$\rightarrow BX = 2B^{-1} D^T$$

(7)

(8)

(i)

(9) [4+

(ii) Evaluat

No marks

$$D = 3.\begin{vmatrix} 6 & 1 \\ 2 & -1 \\ 7 & 1 \\ -5 & 1 \end{vmatrix}$$

$$= 3.(-1)\begin{vmatrix} 8 \\ 9 \\ -1 \end{vmatrix}$$

$$= -9.\begin{vmatrix} 5 \\ 3 \\ -3 \end{vmatrix}$$

(10) [3+3 marks] Le

(i) If $\vec{u} \perp \vec{v}$, th

$\vec{u} \perp \vec{v} \Rightarrow \vec{u}$.

(ii) Simplify th

The expression =

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=

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[redacted]

Need to

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Since

And sin

direct

set $\vec{n}$,

Hence: T

(1

- Need to

$\begin{cases} x-2 \\ 2x-3 \end{cases}$

Thus

- 2nd appr

as a

Now w

Setting :

Thus the

the distan

(15)

Need to s

$$\begin{pmatrix} 3 & -4 \\ 1 & 3 \\ -4 & -1 \end{pmatrix}$$

(i

We may

$\vec{n} = (3, 1$

$= (-11$

Using th

Π:

or