Uva Wellassa University, Sri Lanka

End Semester Examination – February/March 2011

MRT 305-3

Mathematical and Statistical Methods In Mineral Science

Part A

Time: Two (02) hours

Total **04** Questions

Answer **All** questions

Answer Part A in a separate answer book.

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01. a.) Let A be an $n \times m$ matrix and let $H = \{\underline{x} \in R^m : A\underline{x} = \underline{0}\}$. Show that H is a subspace of R^m.

b.) Does the following set of matrices span M_{22}?

$$\left\{\begin{pmatrix} 1 & 0 \\ -1 & 2 \end{pmatrix}, \begin{pmatrix} 1 & 1 \\ 3 & 1 \end{pmatrix}, \begin{pmatrix} 2 & 1 \\ 2 & 1 \end{pmatrix}, \begin{pmatrix} 0 & -1 \\ 0 & 1 \end{pmatrix}\right\}$$

c.) Determine whether the vectors $\begin{pmatrix} 1 \\ -3 \\ 0 \end{pmatrix}, \begin{pmatrix} 3 \\ 0 \\ 4 \end{pmatrix}$ *and* $\begin{pmatrix} 11 \\ -6 \\ 12 \end{pmatrix}$ are linearly dependent or independent.

02. a.) Show that $\begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$ *and* $\begin{pmatrix} 3 \\ 7 \\ -1 \end{pmatrix}$ is a basis of R^3 and construct an orthogonal basis for R^3.

b.) Determine the rank and nullity of the following matrix.

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

03. Determine the eigenvectors corresponding to each eigenvalue and a basis for the eigenspa corresponding to each eigenvalue for the following matrix.

$$A = \begin{pmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{pmatrix}$$

04. a.) Find the equation of the line that will best approximate the points (-2, 4), (1, 1) and (3, 9)

b.) Compute the error for the solution.