(ii)Let $E=\{e_1, e_2, e_3\}=\{(1,0,0),(0,1,0),(0,0,1\}$ be the usual basis of Euclidean space $\mathbb{R}^3$. Show that E is orthonormal set of $\mathbb{R}^3$.

(iii)Consider the matrix $A=\begin{bmatrix} 4 & 3 \\ 0 & -2 \end{bmatrix}$ find the eigenvalues and eigenvectors of A.

(15 Marks)

GOOD LUCK

اسم ورمز المقرر : ٣٤٣ريض الجبر الخطي(٢)
المستوى الخامس
القسم : الرياضيات
الزمن : ساعتان

قسم الرياضيات

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الملك خالد
كلية العلوم والآداب بمحايل

الاختبار النهائي للفصل الدراسي الأول للعام الجامعي ١٤٣٥/ ١٤٣٦ هـ

Answer the following questions:

Q1:

(i)Consider the set $\mathbb{R}^n$.Show that $\mathbb{R}^n$is a vector space under the sum of vectors and scalar multiplication of vectors defined as follows:

$u+v=(a_1,a_2,\dots,a_n)+(b_1,b_2,\dots,b_n)=(a_1+b_1,a_2+b_2,\dots,a_n+b_n)$

$ku=k(a_1,a_2,\dots,a_n)=(ka_1,ka_2,\dots,ka_n)$,k scalar.

(ii) Let $V=M_{n,n}$ the vector space of all matrices of the size $n\times n$. Let W be a set of all symmetric matrices subset of V .Show that W is a subspace of V.

(iii) Consider the vectors $e_1=(1,1,1)$,$e_2=(1,1,0)$,$e_3=(1,0,0)$ show that these vectors are basis on $\mathbb{R}^3$ and find the dimension of $\mathbb{R}^3$.

(iv) Consider the two vectors v_1,v_2 one of them is multiple of the other ,verify that the two vectors are linear dependent or independent.

(20 Marks)

Q2:

(i)Let A be any real $m\times n$ matrix and the transformation

$F_A:\mathbb{R}^n\longrightarrow\mathbb{R}^m$ defined by $F_A(u)=\text{A}u$

Show that $F_A$is a linear transformation.

(ii) Let $F:V\longrightarrow U$ and $G:U\longrightarrow W$ be linear transformation. Show t
$G\circ F$ is also linear transformation.

(iii)Let F be the linear operator on $\mathbb{R}^2$ defined by F(x,y)=(2x-y,2
Show that F is invertible and find the inverse F^{-1}.

(15 Marks)

Q3:

(i)Consider the inner product space V .Show that

$$\langle u,v+w\rangle=\langle u,v\rangle+\langle u,w\rangle$$

Continue