TELANGANA UNIVERSITY
S.S.R. DEGREE COLLEGE, NIZAMABAD (C.C:5029)
V SEMESTER INTERNAL ASSESSMENT II EXAMINATIONS
MATHS (LINEAR ALGEBRA) QUESTION BANK

I. Multiple choice questions.

1. If $A=\begin{bmatrix}4 & -3\\ 2 & -1\end{bmatrix}$ Then A^8 = [c]

a. $A=\begin{bmatrix}2^8 & 0\\ 0 & 1^8\end{bmatrix}$ b. $\begin{bmatrix}256 & 0\\ 0 & 1\end{bmatrix}$ c. $\begin{bmatrix}766 & -765\\ 510 & -509\end{bmatrix}$ d. $\begin{bmatrix}2^8 & 4^8\\ -3^8 & -1^8\end{bmatrix}$

2. The condition for the matrix A to be diagonalizable is [b]

a. $A=PD2P^{-1}$ b. $A=PDP^{-1}$ c. $A=P^{-1}P$ d. $A=DP^{-1}$

3. If $A=\begin{bmatrix}5 & 0 & 0 & 0\\ 0 & 5 & 0 & 0\\ 1 & 4 & -3 & 0\\ -1 & -2 & 0 & -3\end{bmatrix}$ then eigen values are [c]

a. 5,1,4,0 b. 5,-2,-3,1 c. 5,5,-3,-3 d, -1,4,0,5

4. If $T(b_1)=3c_1-2c_2+5c_3$ and $T(b_2)=4c_1+7c_2-c_3$ then the matrix M for T relative to B and C is [b]

a. $\begin{bmatrix}3-2\\ 7\ 5\\ 5\ 4\end{bmatrix}$ b. $\begin{bmatrix}3 & 4\\ -2 & 7\\ 5 & -1\end{bmatrix}$ c. $\begin{bmatrix}3 & -2\\ -2 & 7\\ -1 & 5\end{bmatrix}$ d. $\begin{bmatrix}5 & 5\\ 4 & 7\\ -2 & 3\end{bmatrix}$

5. If $T(a_0+a_1t+a_2t^2) = a_1+2a_2t$ then T(1) = [a]

a. 0 b. 1 c. 2t d. -1

6. The matrix for T relative to the bases B and C is [c]

a. $[T(x)]_c = r_1[T(b_1)]_c+ \ldots\ldots\ldots + r_n[T(b_n)]_c$ b. $T(x) = [T(b_1)T(b_2) \ldots\ldots\ldots T(b_n)]$

c. $M = [[T(b_1)]_c\ [T(b_2)]_c \ldots\ldots\ldots [T[b_n]_c]$ d. $M = [T(c_1)T(c_2) \ldots\ldots\ldots T(c_n)]$

7. If $v_1=\begin{bmatrix}-2 & -4i\\ & 5\end{bmatrix}$ Then P = [Re v_1 Im v_1] is [b]

a. $\begin{bmatrix}-2 & 5\\ 0 & -4\end{bmatrix}$ b. $\begin{bmatrix}-2 & -4\\ 5 & 0\end{bmatrix}$ c. $\begin{bmatrix}0 & 2\\ 5 & -4\end{bmatrix}$ d. $\begin{bmatrix}2 & 4\\ 0 & 5\end{bmatrix}$

8. If $A=\begin{bmatrix}0.5 & -0.6\\ 0.75 & 1.1\end{bmatrix}$ Then the characteristic equation of A is [d]

a. $-3\lambda^2+1.6\lambda+4$ b. $\lambda^2-\lambda+4$ c. $4\lambda^2-3\lambda+2$ d. $\lambda^2-1.6\lambda+1$

9. If $X=\begin{bmatrix}3-i\\ i\\ 2+5i\end{bmatrix}$ Then Re x = [b]

a. $\begin{bmatrix}3\\ 5\\ 2\end{bmatrix}$ b. $\begin{bmatrix}3\\ 0\\ 2\end{bmatrix}$ c. $\begin{bmatrix}-1\\ 1\\ 5\end{bmatrix}$ d. $\begin{bmatrix}3\\ 1\\ 2\end{bmatrix}$

10. If the eigen value $\lambda=a+bi$ then $\bar{\lambda}$ = [a]

a. a-bi b. bi c. –a d. b-ai

11. If u, v, w $\in R^n$ and ‘c’ be any scalar then [d]

a. (u+v).w = u.w + v.w b. (cu).v = u.(cv) c. u.v$\geq$0; u.u = 0 if and only if u = 0 d. All the above

12. A set of vectors $\{u_1,u_2, \ldots\ldots\ldots u_p\}$ in R^n is said to be an orthogonal set if [b]

a. $u_iu_j \neq 0$ whenever $i \neq j$ b. $u_iu_j = 0$ whenever $i \neq j$ c. $u_i + u_j = 0$ whenever i = j d. None of the above

13. Two vectors u and v are orthogonal if and only if [b]

a. $\|u-v\|^2 = \|u\|^2 + \|v\|^2$ b. $\|u+v\|^2 = \|u\|^2 + \|v\|^2$

c. $\|u.v\|^2 = \|u\|^2 + \|v\|^2$ d. $\left\|\frac{u}{v}\right\|^2 = \frac{\|u\|^2}{\|v\|^2}$

14. If u = (u_1, u_2, u_3) and v = (v_1, v_2, v_3) then dist (u,v) = [c]

a. $\sqrt{(u_1+v_1)^2+(u_2+v_2)^2+(u_3+v_3)^2}$ b. $\sqrt{(u_1+v_1)^2-(u_2+v_2)^2-(u_3+v_3)^2}$

c. $\sqrt{(u_1-v_1)^2+(u_2-v_2)^2+(u_3-v_3)^2}$ d. $\sqrt{(u_1-v_1)^2}+\sqrt{(u_2-v_2)^2}+\sqrt{(u_3-v_3)^2}$

15. A set {u_1, u_2, u_3 …………… u_p} is an ___________ set if it is an orthogonal set of unit vectors. [c]

a. Linearly dependent b. Orthogonal c. Orthonormal d. None of these

16. An m x n matrix A has orthonormal columns if and only if, [d]

a. A = A^T b. A-A^T=1 c. A+A^T=1 d. A^TA=1

17. If A is an m x n matrix. Then (Row A) $^\perp$ = [a]

a. Nul A b. Nul A^T c. Nul A^{-1} d. None of the above

18. Let A be an m x n matrix with orthonormal columns, and x,y $\in R^n$ then [d]

a. $\|Ax\| = \|x\|$ b. (Ax).(A.y)=x.y

c. (Ax).(A.y)=0 if and only if x.y=0 d. All the above

19. If {u_1, u_2 ……………. up} is an orthonormal basis and U = [u1 u2 …………. up] then [c]

a. $proj_w y = Ip_x$ b. $proj_w y = UU^Tx$ c. $proj_w y = UU^Ty$ d. None of the above

20. If A is a m x n matrix with linearly independent columns then A can be factored as, [a]

a. A = QR b. A = $Q^{-1}R$ c. A = $Q^{-1}R^{-1}$ d. None of the above

Fill in the blanks.

1. An n x n matrix is diagonalizable if and only if A has ‘n’ linearly independent.
2. An n x n matrix with n distinct eigen values is Diagonalizable
3. A matrix ‘A’ of order n x n is diagonalizable if and only if the sum of the dimensions of the different eigenspaces equals n
4. Let A = PDP^{-1}, where D is a diagonal matrix. If B is the basis for R^n then D is the B-matrix for the transformation $x \to Ax$
5. A square matrix A is diagonalizable if A is similar to Diagnal matrix.
6. A is diagonalizable if and only if there are enough eigenvectors to form a Basis of R”
7. For all x in V, the B-matrix for $T: V \to V$ satisfies $[T(x)]_B = [T]_B[X]_B$
8. The complex conjugate of a complex vector x in C^n is the vector $\bar{x}$ in C^n
9. If A is real, then its complex eigenvalues occur in Conjugate pairs
10. A Saddle point arises when the matrix A has both positive and negative eigenvalues.
11. If ‘v’ is a vector then length (or norm) of v is, $\|v\|$
12. The distance between ‘u’ and ‘v’ is $\|u-v\|$ $\forall$ u,v $\in R^n$
13. Two vectors u and v are orthogonal if u.v = 0 for u,v $\in R^n$
14. The set of all vectors z that are orthogonal to W is called the orthogonal complement of W.
15. A vector x is in $W^\perp$ if and only if x is orthogonal to every vector in a set that spans W.
16. A is an m x n matrix then $(ColA)^\perp = NulA^T$
17. If u.v are non-zero vectors and θ is the angle between them then u.v = $\|u\|\|v\|\cos\theta$
18. By orthogonal decomposition theorem, y can be written uniquely in the form $y = \hat{y} + z$
19. The best approximation to y by elements of W is the vector $\hat{y}$
20. In QR factorization of matrix A, the upper triangular matrix R is obtained by the transformation Q^TA