BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I COMPUTER :SUMMER- 2022
SUBJECT : MATHEMATICS FOR COMPUTING-I

Day : Monday
Date : 18-07-2022

S-24005-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat labelled diagrams **WHEREVER** necessary.
4) Use of non- programmable **CALCULATOR** is allowed.

Q.1 Reduce the Matrix $A=\begin{bmatrix} 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 9 & 10 & 11 & 12 \end{bmatrix}$ to an echelon form and further reduce A to its row canonical form. **(10)**

OR

Q.1 Find LU factorization of $A=\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 3 \\ -3 & -10 & 2 \end{bmatrix}$ **(10)**

Q.2 Find a subset of u_1, u_2, u_3 that gives a basis for $w = \text{span}\left(u_i\right)$ of R^5, where **(10)**

$u_1 = (1,-2,1,3,-1)$, $u_2 = (-2,4,-2,-6,2)$

$u_3 = (1,-3,1,2,1)$, $u_4 = (3,-7,3,8,-1)$

OR

Q.2 Find the dimension and basis fo the subspace W of $P_3(t)$ spanned by **(10)**

$u = t^3 + 2t^2 - 3t + 4,\ v = 2t^3 + 5t^2 - 4t + 7,\ w = t^3 + 4t^2 + t + 2.$

Q.3 Let $F : \mathrm{R}^4 \rightarrow R^3$ be linear map defined by **(10)**

$F(x,y,z,t) = (x+2y+3z+2t, 2x+4y+7z+5t,\ x+2y+6z+5t)$

Find a basis and dimension of image of F and Kernel of F.

OR

Q.3 Determine whether or not linear map F is non-singular. If not, find a nonzero vector V whose image is 0; otherwise find a formula for the inverse map. **(10)**

$F : R^3 \rightarrow R^3$ defined by $F(x,y,z) = (x+y+z,\ 2x+3y+5z, x+3y+7z)$

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Q.4 Let G be the linear operator on R^3 defined by $G(x,y,z)=(2y+z,x-4y,3x)$. Find the matrix representation of G relative to the basis $S=\{w_1,w_2,w_3\}=\{(1,1,1),(1,1,0),(1,0,0)\}$. Verify that $[G][v]=[G(v)]$ for any vector v in R^3. **(10)**

OR

Q.4 Consider the following bases of R^2 **(10)**
$E=\{e_1,e_2\}=\{(1,0),(0,1)\}$ and $S=\{u_1,u_2\}=\{(1,3),(1,4)\}$. Find the change of basis matrix P from P form the usual basis E to S. Find the change of basis of matrix Q from S back to E.

Q.5 Let S consist of the following vectors in R^4. **(10)**
$u_1=(1,1,0,-1)$, $u_2=(1,2,1,3)$, $u_3=(1,1,-9,2)$, $u_4=(16,-13,1,3)$. Show that S is coordinates of an arbitrary vector $v=(a,b,c,d)$ in R^4 relative to the basis S.

OR

Q.5 Apply the Gram-Schmidt orthogonalization process to find an orthogonal basis and then orthonormal basis for the subspace U of R^4 spanned by $v_1=(1,1,1,1)$, $v_2=(1,2,4,5)$, $v_3=(1,-3,-4,-2)$. **(10)**

Q.6 Find the Eigen values and Eigen vectors of matrix A, Where **(10)**

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

OR

Q.6 Verify Cayley-Hamilton theorem for matrix A and use it to find A^4 and A^{-1} **(10)**

$$A=\begin{bmatrix}1 & 1 & 2\\ 3 & 1 & 1\\ 2 & 3 & 1\end{bmatrix}$$

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