UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program :Third Semester – 2020

Paper: Mathematics A-III **(CLASH)**

Course Code: MATH-201/MTH-21309Part – I (Compulsory) **Time: 30Min. Marks: 10**

Roll No. in Fig. ……

Roll No. in Words. ……

……

……

Signature of Supdt.:

Attempt this Paper on this Question Sheet only.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer cutting and overwriting is not allowed. (10x1=10)

(i)	A unit vector orthogonal to both $(1, 1, 2)$ and $(0, 1, 3)$ in R^3 is ---------- **(a)** $\left(\frac{1}{\sqrt{11}}, \frac{-3}{\sqrt{11}}, \frac{1}{\sqrt{11}}\right)$ **(b)** $\left(\frac{-1}{\sqrt{11}}, \frac{3}{\sqrt{11}}, \frac{1}{\sqrt{11}}\right)$ **(c)** $\left(\frac{2}{\sqrt{11}}, \frac{-3}{\sqrt{11}}, \frac{-1}{\sqrt{11}}\right)$ **(d)** $\left(\frac{-1}{\sqrt{11}}, \frac{-3}{\sqrt{11}}, \frac{1}{\sqrt{11}}\right)$
(ii)	The set $S = \left\{\begin{bmatrix}1\\2\end{bmatrix}, \begin{bmatrix}2\\3\end{bmatrix}, \begin{bmatrix}0\\0\end{bmatrix}\right\}$ of vectors in R^2 is …… **(a)** Linearly Independent **(b)** Linearly dependent **(c)** Basis of R^2 **(d)** None of these
(iii)	If A is a matrix of order 4×4 and $\det(A) = -1$, then the value of $\det(2A)$ is -------- **(a)** -4 **(b)** 16 **(c)** 4 **(d)** -16
(iv)	The dimension of Column Space is called …….. **(a)** Rank **(b)** Nullity **(c)** basis **(d)** none of these
(v)	The characteristic polynomial of the matrix $\begin{pmatrix}-3 & 0\\0 & 2\end{pmatrix}$ is……. **(a)** $p(\lambda) = (2-3\lambda)^2$ **(b)** $p(\lambda) = (-3-\lambda)(2-\lambda)$ **(c)** $p(\lambda) = 0$ **(d)** None of these
(vi)	A system of m homogeneous linear equations $Ax = 0$ in n variables has a non-trivial solution if and only if the rank of A is ---------- **(a)** equal to n **(b)** less than n **(c)** greater to n **(d)** None of these
(vii)	The property $\forall$ a, b, c $\in$ R then $a+(b+c) = (a+b)+c$ is called **(a)** Associative property **(b)**Transitive property **(c)** Closure property **(d)** None of these
(viii)	If W is a linear subspace of V then **a)** $\dim(W) \le \dim(V)$ **(b)** $\dim(W) \ge \dim(V)$ **(c)** $\dim(W) = \dim(V)$ **(d)**None of these
(ix)	The subspace of R^3 spanned by the vector (a, b, c) is ---------- **(a)** $x = t, y = bt, z = ct$ **(b)** $x = -at, y = -bt, z = -ct$ **(c)** $x = at, y = bt, z = ct$ **(d)** None of these
(x)	A symmetric matrix of order 5 has -------- eigen values. **(a)** 4 **(b)** 6 **(c)** 5 **(d)** 0

UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program :Third Semester – 2020

Roll No. ……

Paper: Mathematics A-III **(CLASH)** **Time: 2 Hrs. 30 Min. Marks: 50**

Course Code: MATH-201/MTH-21309 Part – II

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2. Solve the following: **(5x4=20)**

(i)	Determine whether the vectors are linearly independent or not? $v_1=(1,-2,3), v_2=(5,6,-1), v_3=(3,2,1)$	(4)
(ii)	If $(A^T-2I)^{-1}=\begin{bmatrix}3 & 0\\ 1 & -1\end{bmatrix}$ then find A.	(4)
(iii)	Define $T: R^3 \to R^3$ by $T(x_1,x_2,x_3)=(-x_3,x_1,x_1+x_3)$. Find $N(T)$. Is T one-to-one?	(4)
(iv)	Check whether W is a subspace of V or not. $V=\{f:\ f: R\to R\}$, $W=\{f\in V:\ f(1)=0\}$.	(4)
(v)	Check whether the functions $f(t)=\tan t$, $g(t)=\sin t$, $h(t)=\cos t$ from R to R are linearly independent.	(4)

Solve the following: **(5x6=30)**

Q.3	Solve the system of linear equations $2x+y+z=1,\ 3x+y-5z=8,\quad 4x-y+z=5$	(6)
Q.4	If possible, find the inverse of the matrix $\begin{bmatrix}1 & 2 & -3\\ 0 & -2 & 0\\ -2 & -2 & 2\end{bmatrix}$	(6)
Q.5	Show that $\begin{vmatrix}1+x & 1 & 1 & 1\\ 1 & 1-x & 1 & 1\\ 1 & 1 & 1+y & 1\\ 1 & 1 & 1 & 1-y\end{vmatrix}=x^2y^2$	(6)
Q.6	**(b)** Inside R^3, decide which of the following set(s) is (are) linearly independent $\{v_1,v_2,\}\ \{v_2,v_3,v_4,\}, \{v_3,v_4,\}$, where $v_1=(0,0,0),\ v_2=(1,0,1), v_3=(1,-1,0), v_4=(1,0,-1)$.	(6)
Q.7	Find the basis of Null space associated with the given matrix. $\begin{bmatrix}1 & 2 & 2 & -1\\ 3 & 6 & 5 & 0\\ 1 & 2 & 1 & 0\end{bmatrix}$	(6)