I Unit Test

Total marks:50 **Time: 1hr 30min**

PART-A

Answer all questions $1\times5=5$

1. A relation R on $A=\{1,2,3\}$ defined by $R=\{(1,1),(2,1),(3,3)\}$ is not symmetric. Why?
2. Find the principal value branch of $\sec^{-1}x$.
3. Define a Scalar matrix.
4. Find the values of x for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$.
5. Differentiate $\tan(2x+3)$ with respect to x.

PART-B

Answer any FIVE questions $2\times5=10$

6. Given an example of a relation, which is Reflexive and symmetric but not transitive.
7. Find the value of $\tan^{-1}\left(2\cos\left(2\sin^{-1}\left(\frac{1}{2}\right)\right)\right)$.
8. Find the value of $\tan^{-1}(1)+\cos^{-1}\left(-\frac{1}{2}\right)+\sin^{-1}\left(\frac{1}{2}\right)$.
9. Find the area of the triangle with vertices $(2,\ 7),(1,\ 1)$ *and* $(10,\ 8)$.
10. If $A=\begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then show that $|2A|=4|A|$.
11. Differentiate $\sin(\cos(x^2))$ with respect to x.
12. If $2x+3y=\sin y$, find $\frac{dy}{dx}$.

PART-C

Answer any FIVE questions $3\times5=15$

13. Show that the relation R in the set R of real numbers, defined as $R=\{(a,b):a\le b^2\}$ is neither reflexive nor symmetric nor transitive.
14. Let T be the set of all triangles in a plane with R a relation in T given by $R=\{(T_1,T_2):T_1\ is\ similar\ to\ T_2\}$. Show that R is an equivalence relation.
15. Express $A=\begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$ as sum of symmetric and skew symmetric matrix.
16. If $A=\begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$, then find AB and BA and verify that $AB\ne BA$.
17. If $x\sqrt{1+y}+y\sqrt{1+x}=0,\ for\ -1<x<1,\ x\ne y$, then prove that $\frac{dy}{dx}=-\frac{1}{(1+x)^2}$.
18. Prove that the function f given by $f(x)=|x-1|, x\in R$ is not differentiable at $x=1$.
19. Find $\frac{dy}{dx}$, if $x^2+xy+y^2=100$.

PART-D

Answer any THREE questions $5\times 3=15$

20. Prove that the function $f:R\to R$ defined by $f(x)=3-4x$ is bijective.

21. Check whether the function $f:R\to R$ defined by $f(x)=1+x^2$ is bijective or not. Justify your answer.

22. If $A=\begin{bmatrix}0 & 6 & 7\\ -6 & 0 & 8\\ 7 & -8 & 0\end{bmatrix}$, $B=\begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 2\\ 1 & 2 & 0\end{bmatrix}$, $C=\begin{bmatrix}2\\ -2\\ 3\end{bmatrix}$, verify that $(A+B)C=AC+BC$.

23. If $A'=\begin{bmatrix}3 & 4\\ -1 & 2\\ 0 & 1\end{bmatrix}$ $and\ B=\begin{bmatrix}-1 & 2 & 1\\ 1 & 2 & 3\end{bmatrix}$, then verify that $(A+B)'=A'+B'$.

24. Solve the system of linear equations, using inverse of a matrix:
$x-y+2z=7, 3x+4y-5z=-5, 2x-y+3z=12$.

PART-E

Answer any ONE questions $1\times 5=5$

25. **(a)** If $A=\begin{bmatrix}2 & 3\\ 1 & 2\end{bmatrix}$ satisfies the equation $A^2-4A+I=O$, where I is 2×2 identity matrix and O is 2×2 zero matrix. using this equation, find A^{-1}.------------------------4

(b) Differentiate $\cos^{-1}(\sin x)$ with respect to x. ---------------------------------------1

26. **(a)** Find the values of a and b such that the function defined by

$$f(x)=\begin{cases}5, & if\ x\le 2\\ ax+b, & if\ 2<x<10\\ 21, & if\ x\ge 10\end{cases}$$

is a continuous function. --------------------------4

(b) Find the derivative of $e^{\log x}$ with respect to x. -------------------------------------1