GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of University Polytechnic

Diploma in Civil Engineering

Summer Term Examination – July - August 2024

Duration : 180 Minutes
Max Marks : 100

Sem I - N1DF101T- MATD1002- Applied Mathematics-I

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Find the number of terms in the expansion of $(x^2 - 2x + 1)^5$	K1	(2)
2)	Explain sphere and its radius and center.	K2	(4)
3)	Show that $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ac & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0$	K2	(6)
4)	Identify $\lvert\vec{a} \times \vec{b}\rvert$ where $\vec{a} = 2\hat{\imath} + \hat{\jmath} + 3\hat{k}$ and $\vec{b} = 3\hat{\imath} + 5\hat{\jmath} - 2\hat{k}$.	K3	(9)
5)	Solve $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$	K3	(9)
6)	If the latus rectum of an ellipse is equal to half of the minor axis, evaluate its eccentricity.	K5	(10)
7)	Classify the conic section in details.	K4	(12)
8)	For any vector $\vec{a}$, Prove that $\hat{\imath} \times (\vec{a} \times \hat{\imath}) + \hat{\jmath} \times (\vec{a} \times \hat{\jmath}) + \hat{k} \times (\vec{a} \times \hat{k}) = 2\vec{a}$	K5	(15)
9)	Prove that i) $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{2}{5} = \tan^{-1}\frac{11}{13}$ ii) $\sin^{-1} x + \sin^{-1} y = \sin^{-1}\left\{x\sqrt{1-y^2} + y\sqrt{1-x^2}\right\}$.	K5	(15)
10)	If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$. Estimate the value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$.	K6	(18)