


VIT

Vellore Institute of Technology
(Approved to be University under section 3 of the UGC Act, 1956)
Final Assessment Test – November 2025

Course: **BAMAT100 - Foundations of Mathematics**

Class NBR(s): **6350**

Time: **Three Hours**

Slot: **C1+TC1+TCC1**

Max. Marks: **100**

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

COs	CO Statements
CO1	Use matrix methods to solve system of linear equations.
CO2	Describe the importance of Complex numbers and their applications.
CO3	Apply the concept of derivatives as rates of change in max-min problems.
CO4	Find areas and volumes using integration techniques.
CO5	Solve linear first order ordinary differential equations.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
Answer ALL Questions
(10 X 10 = 100 Marks)

- Find the solution of the system of equations by using the matrix inversion method: $3x + 2y + 4z = 21$; $x + 3y + 2z = 16$; $5x + y + z = 19$. CO1 BL5
- Test for consistency the following equations and solve them if consistent: $x + y + z = 6$; $2x + y + 3z = 13$; $5x + 2y + z = 12$. CO1 BL4
- Show that $2^5 \sin^4 \theta \cos^2 \theta = \cos 6\theta - 2\cos 4\theta - \cos 2\theta + 2$. CO2 BL2
- If $u = \log \tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$, then prove that $\tan h \frac{u}{2} = \tan \frac{\theta}{2}$. [5] CO2 BL4
 - Prove that $\tan h^{-1} x = \frac{1}{2} \log \frac{1+x}{1-x}$. [5]
- Expand $\cos(x) \log(1+x)$ about $x = 0$ using Taylor series up to the 4th order term. CO3 BL3
- Find the equation of the tangent and normal to the curve $y = x^2$ at $x = 1$. [5] CO3 BL5
 - Find the absolute maximum and absolute minimum of $f(x) = 3x^4 - 4x^3 - 12x^2 + 1$ on $[-2, 3]$. [5]
- Evaluate the integral $\int x^4 \cos(x) dx$ by using integration by parts. CO4 BL3
- Find the volume bounded by the cylinder $x^2 + y^2 = a^2$ and the plane $z = \sqrt{x^2 + y^2}$, above the xy plane ($z = 0$). CO4 BL5
- Solve $(3x^2y + 2y)dx + (x^3 + 2x + 1)dy = 0$. CO5 BL2

OR

- Solve $(ye^{xy} + 1)dx + (xe^{xy})dy = 0$. CO5 BL2

10.a) Solve $\frac{dy}{dx} + y = y^2 e^x$.

CO5 BL5

OR

10.b) A hot metal rod at 150°C is placed in a room at 25°C . After 5 minutes, the rod cools down to 100°C . Find:

CO5 BL5

(i) The cooling constant k . (ii) The temperature after 10 minutes.

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