

School of Basic Sciences
Bachelor of Science Honours in Mathematics
Mid Term Examination - Nov 2023

Duration : 90 Minutes
 Max Marks : 50

Sem III - C1UC305T - Trigonometry and Linear Algebra

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) Does the set $V = \{(x, y, z) \mid x + y + z = 1\}$ form a subspace? Explain reasons for your answer. K2 (2)
- 2) Find the general value of $\log(-1 + i)$. K1 (3)
- 3) Find the real and imaginary parts of $\sinh(\alpha + i\beta)$ and $\cosh(\alpha + i\beta)$. K2 (4)
- 4) Show that $\sinh(x + y) \cosh(x - y) = \frac{1}{2}(\sinh 2x + \sinh 2y)$. K2 (6)
- 5) Develop the following relation: K3 (6)

$$\tanh(x + y) = \frac{\tanh x + \tanh y}{1 + \tanh x \tanh y}$$
- 6) Solve $i^{i^i} = \cos \theta + i \sin \theta$. K3 (9)
- 7) Examine whether the following vectors in \mathbb{R}^4 are linearly dependent or independent: $(1, 2, -3, 1), (3, 7, 1, -2), (1, 3, 7, -4)$. K4 (8)
- 8) Let \mathbb{Q} be the set of scalars. Then, analyze that $V = \{a + b\sqrt{2} : a, b \in \mathbb{Q}\}$ forms a vector space. K4 (12)

OR

Let \mathbb{Q} be the set of scalars. Then, analyze that $V = \{a + b\sqrt{-3} : a, b \in \mathbb{Q}\}$ forms a vector space. K4 (12)