CINEC CAMPUS
Beyond A Graduate

CINEC CAMPUS
FACULTY OF ENGINEERING & TECHNOLOGY
BACHELOR OF SCIENCE HONOURS IN ENGINEERING

IS1301 Calculus
In class Test - 1

Time allowed: 2 hours **1st of August 2026**

Answer All Questions.

INSTRUCTIONS TO CANDIDATES

- This is a closed book examination.
- Attempt **all questions.**
- Show all stages of your work.
- You should write legibly in black or blue ink.

MATERIALS REQURIED

- Two eight-page answer booklets
- You may use a scientific calculator. This must not be programmable and may be inspected during the examination.

1. a) Solve each of the following inequalities:

i) $\frac{3x-1}{x-1} > 2$

ii) $\frac{3x^2+2x-1}{x+1} \leq 3x + 1$

b) Solve the following equation:

$2|x - 1| - |x - 2| = 3$.

(30 Marks)

2.a) Sketch the locus defined by

$|z - 2i| = |z - 3 + i|$.

b) Use De Moivre's theorem to find $(\sqrt{3} + i)^6$.

c) Find all fourth roots of $1 + i$.

(30 Marks)

3. a) i) Find an equation of the parabola with vertex (0,0), axis x axis and passing through $(-1, -4)$.

ii) Find an equation of the ellipse with foci $(3, -2)$, $(5, -2)$ and vertices $(1, -2)$, $(7, -2)$.

iii) Find an equation of the hyperbola with foci $(1,3),(7,3)$ and vertices $(2,3)$, $(6,3)$.

b) A bridge arch has the shape of a parabola. The arch is 40 m wide and reaches a maximum height of 8m above the road. A truck 3m wide travels along the center of the road. Find the maximum height of the truck that can safely pass under the bridge correct to three significant figures.

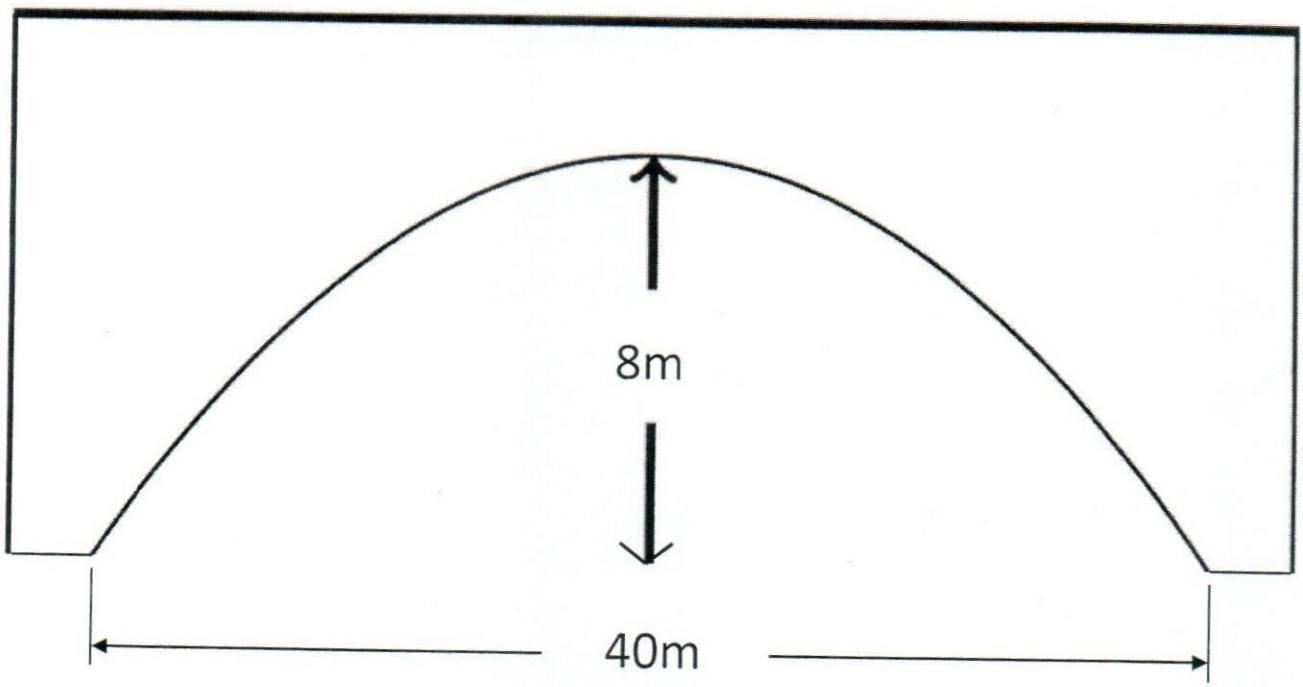

Figure 1

(40 Marks)

Additional Information

n^{th} root formula:

$$\sqrt[n]{r}\left(\cos\frac{\theta+2\pi k}{n}+i\sin\frac{\theta+2\pi k}{n}\right) \quad k=0,1,2,\ldots n-1$$

DeMoivre's Theorem

If $z = r(\cos\theta + i\sin\theta)$ is a complex number and n is a positive integer, then

$$z^n = [r(\cos\theta + i\sin\theta)]^n$$
$$= r^n(\cos n\theta + i\sin n\theta).$$