INTI International University & Colleges

FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2021**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI) Diploma in Mechanical Engineering (DMEN)
Course	:	**MAT1121/MAT1134: Engineering Mathematics 1**
Date of Examination	:	26 July 2021 (Monday)
Time	:	4.00pm – 6.15pm Reading Time : Nil
Duration	:	2 Hours 15 Minutes

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Mathematics Formulae Booklet

Examiner(s)	:	**Chong Mee Teng,** Manickampraslad M Sambasivam
Chief Moderator	:	Mohd Hafis Zakaria

*This paper consists of **5** printed pages, including the cover page*

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME (DEEI)
DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
MAT1121 / MAT1134: ENGINEERING MATHEMATICS 1
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

Instruction: This paper consists of **FOUR (4)** questions. Answer **ALL** the questions. All questions carry equal marks.

Question 1

(a) Suppose that $\sin\alpha = \frac{12}{13}$ for a quadrant II angle α, and $\sin\beta = \frac{3}{5}$ for a quadrant I angle β. Compute the exact value of each of the following:

(i) $\cos\alpha$

(3 marks)

(ii) $\cos\beta$

(3 marks)

(iii) $\cos(\alpha+\beta)$

(3 marks)

(b) In **Figure Q1(b)**, you are on a fishing boat that leaves its pier and heads east. After travelling for 25 miles, there is a report warning of rough seas directly south. The captain turns the boat and follows a bearing of S40°W for 13.5 miles. Solve:

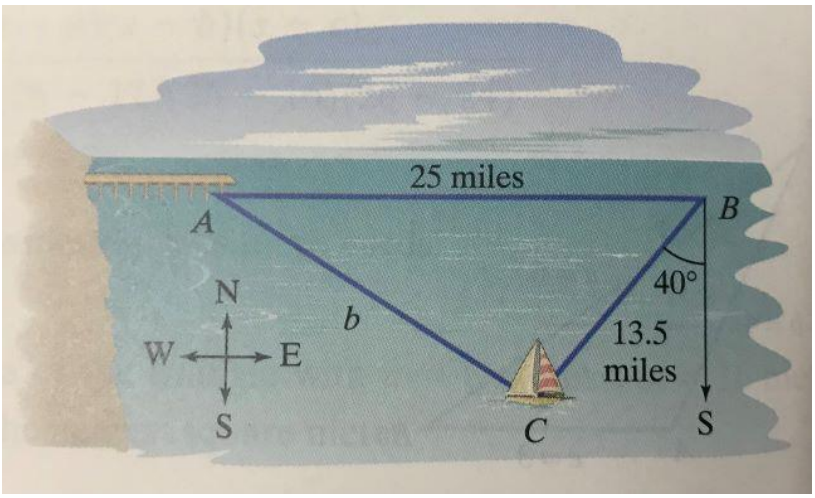

Figure Q1(b)

(i) the distance between you from the boat's pier at this time,

(4 marks)

(ii) the bearing could the boat have originally taken to arrive at this spot.

(4 marks)

(c) The cross-section of a water wave is given by $y = 3\sin\left(\frac{\pi}{4}x + \frac{\pi}{4}\right)$, where y is the vertical height of the water wave and x is the distance from the origin to the wave.

(i) Compute the amplitude, period and phase shift of the water wave.

(5 marks)

(ii) Sketch one cycle of the water wave.

(3 marks)

Question 2

(a) If $\sin\theta = \frac{5}{13}$ and θ lies in quadrant II, compute the exact value of each of the following:

(i) $\sin 2\theta$

(3 marks)

(ii) $\cos 2\theta$

(3 marks)

(iii) $\tan 2\theta$

(3 marks)

(b) Solve $sec^2\theta = 4 + 2\tan\theta$ for $0^o \leq \theta \leq 360^o$.

(5 marks)

(c) Use trigonometry identity to prove: $\frac{\cos x}{1-\sin x} - \frac{1}{\cos x} = \tan x$.

(5 marks)

(d) In **Figure Q1(d)**, a new homeowner has a triangular-shaped back yard. Two of the three sides measures 53 ft and 42 ft and an angle of 20°. To determine the amount of fertilizer and grass seed to be purchased, the owner has to know, or at least approximate the area of the yard. Solve the area of the yard to the nearest square foot.

(6 marks)

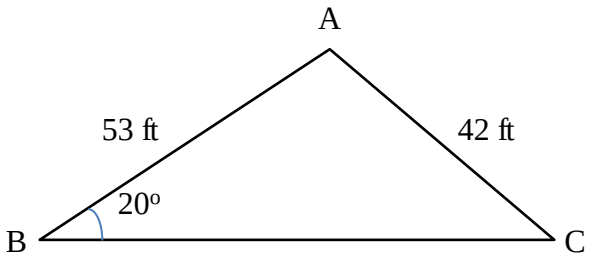

Figure Q1(d)

Question 3

(a) In **Figure Q3(a)**, a hot-air balloon is rising vertically. From a point on level ground 125 feet from the point directly under the passenger compartment, the angle of elevation to the balloon changes from 19.2° to 31.7°. Solve the distance the balloon rise during this period, to the nearest tenth of a foot.

(5 marks)

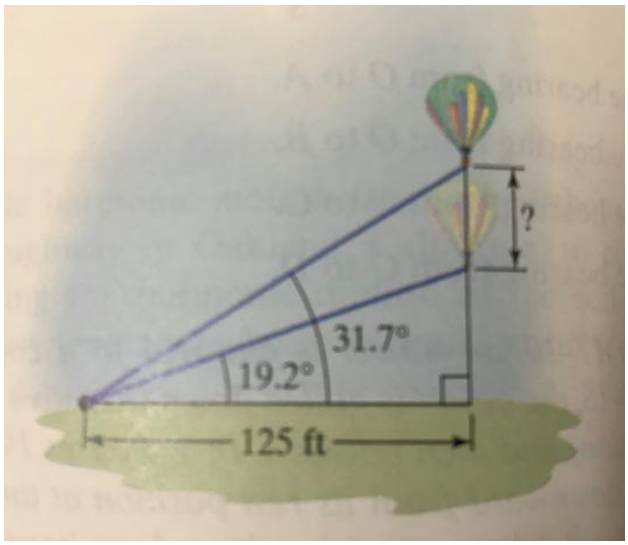

Figure Q3(a)

(b) Solve the coefficient of x^3 in the expansion of $(3x-4)^5$.

(5 marks)

(c) Compute the first four terms in the expansion of $(2-3x)^{10}$ in descending power of x. By putting $x = \frac{1}{100}$, find an approximation to 1.97^{10} correct to the nearest whole number.

(4 marks)

(d) Solve the following hyperbolic equations:

(i) $7\sinh x - 5\cosh x = -1$

(6 marks)

(ii) $2\cosh^2 x - \sinh x = 3$

(5 marks)

Question 4

(a) In **Figure Q4(a)**, a cable car that carries passengers from A to C. Point A is 1.6 miles from the base of the mountain. The angles of elevation from A and B to the mountain's peak are 22° and 66°, respectively. Solve:

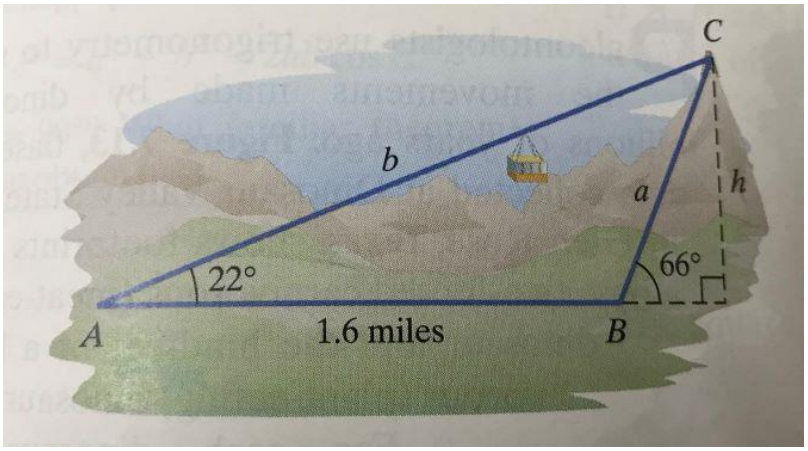

Figure Q4(a)

(i) the distance covered by the cable car,

(4 marks)

(ii) the distance a in the oblique triangle $\boldsymbol{ABC}$.

(3 marks)

(b) (i) Compute the point in polar coordinates to Cartesian coordinates: $(-6, \frac{3\pi}{2})$

(3 marks)

(ii) Compute the point in Cartesian coordinates to polar coordinates: $(-2, 2)$

(3 marks)

(c) Solve the rectangular equation into polar form: $(x-2)^2 + y^2 = 4$

(4 marks)

(d) Replace the following polar equations by equivalent Cartesian equations and describe their graphs.

(i) $r = \pm 3$

(4 marks)

(ii) $r = \dfrac{-2}{\sin\theta - 3\cos\theta}$

(4 marks)

~THE END~