INTI International University & Colleges

FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**January 2021**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI) Diploma in Mechanical Engineering (DMEN)
Course	:	**MAT1121/MAT1134: Engineering Mathematics 1**
Date of Examination	:	12 March 2021 (Friday)
Time	:	12.00noon – 2.15pm 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**
Chief Moderator	:	Dr Chan Kah Yein

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

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

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

Question 1

(a) Given that $\sin 50^o = b$, express each of the following in terms of b.

(i) $\sin 230°$

(3 marks)

(ii) $\cos 50°$

(3 marks)

(iii) $\tan 40°$

(3 marks)

(b) **Figure Q1(b)** shows a roof truss PQR with rafter $PQ = 3$ m. Calculate:

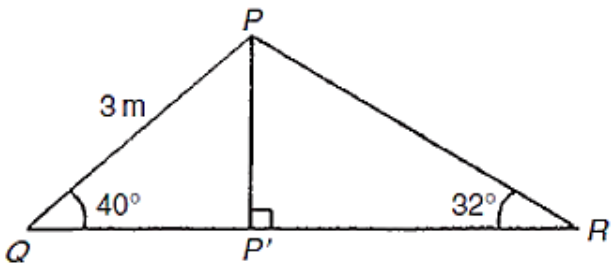

Figure Q1(b)

(i) the length of the roof rise PP',

(2 marks)

(ii) the length of the rafter PR,

(2 marks)

(iii) the length of the roof span QR,

(3 marks)

(c) The current in an alternating current circuit at any time, t seconds is given by: $I = 120\sin(100\pi t + 0.274)$ amperes.

(i) Determine the amplitude, period and phase shift of the function.

(5 marks)

(ii) Sketch one cycle of the oscillation.

(4 marks)

Question 2

(a) Given that $\sin A = \frac{4}{5}$ and $\sin B = \frac{12}{13}$, where A is obtuse and B is acute, find the value of:

(i) $\sin(A + B)$

(3 marks)

(ii) $\cos(A - B)$

(3 marks)

(iii) $\tan(A - B)$

(3 marks)

(b) Solve $\tan^2 x + \sec x - 1 = 0$ for $0^o \leq x \leq 360^o$.

(5 marks)

(c) Prove the identity $\frac{1+\sin x}{\cos x} + \frac{\cos x}{1+\sin x} = \frac{2}{\cos x}$.

(5 marks)

(d) A farmer has a triangular field with sides 120 m, 170 m and 220 m. Find the area of the field in square metres.

(6 marks)

Question 3

(a) As shown in the **Figure Q3(a)**, from a point on horizontal ground a surveyor measures the angle of elevation of the top of a flagpole as 18^o. He moves 50 m nearer to the flagpole and measures the angle of elevation as 26^o. Determine the height of the flagpole.

(7 marks)

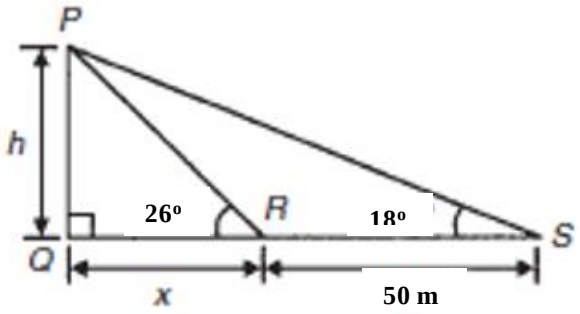

Figure Q3(a)

(b) (i) Obtain the first three terms in the expansion of $(2-x)(1+2x)^9$.

(5 marks)

(ii) Apply your answer in part (i) to estimate the value of 1.99×1.02^9.

(3 marks)

(c) Solve the following hyperbolic equations:

(i) $4\cosh x - \sinh x = 8$

(5 marks)

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

(5 marks)

Question 4

(a) As shown in the **Figure Q4(a)**, two surveyors, Alice and Bob need to determine the height of a steep cliff. They stand 50 m apart where they each have a clear view of the cliff and each other. Bob measures an angle of elevation of 61° from the base of the cliff to its highest point. He also measures the angle between Alice and the base of the cliff as 72°. Alice measures the angle between Bob and the base of the cliff as 38°. How tall is the cliff?

(7 marks)

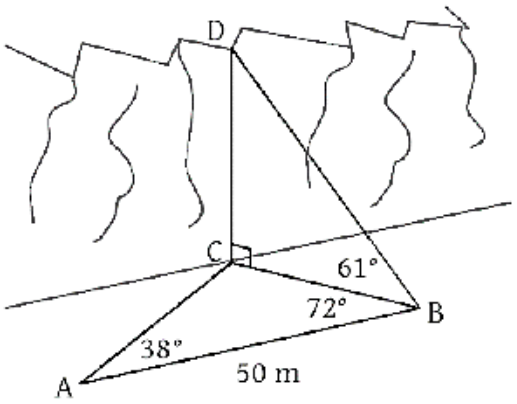

Figure Q4(a)

(b) Convert the following points in polar coordinates to Cartesian coordinates:

(i) $(\sqrt{2}, \frac{\pi}{4})$

(3 marks)

(ii) $(-1, 7\pi)$

(3 marks)

(c) Convert the polar equation into rectangular form: $r = a\cos\theta \sin 2\theta$

(4 marks)

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

(i) $r\cos\theta = -4$

(3 marks)

(ii) $r = \frac{4}{2\cos\theta - \sin\theta}$

(5 marks)

~THE END~