FIJI NATIONAL UNIVERSITY

College of Engineering, Science and Technology (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

TRADE DIPLOMA IN ELECTRICAL ENGINEERING [ELECTRICAL & ELECTRONICS]

EEE401 –MATHEMATICS FOR TECHNICIANS I
FINAL EXAMINATION
SEMESTER I, 2012

STAGE 1
GROUPS: TDEEL 1 & TDEEN 1

DATE: 14/06/2012 **TIME: 9.00-11.10 AM**

VENUE: TBA

INSTRUCTIONS:

1. 10 minutes **EXTRA** is allowed as reading time during which you are **NOT** to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscap, graph paper, drawing paper, etc. in their correct sequence and secure with string
5. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
6. Answers to all questions must be written in **INK** on the Answer Sheet provided.
7. No programmable calculators are allowed.
8. Answer all questions.

SECTION A –LONG ANSWERS [100 MARKS]
Answer ALL questions

Question No.1

Evaluate the following:

a) $\left(\frac{2}{3}\times 1\frac{1}{4}\right)\div\left(\frac{2}{3}+\frac{1}{4}\right)+1\frac{3}{5}$ [5 marks]

b) $\dfrac{\left(\frac{1}{2}\right)^3-\left(\frac{2}{3}\right)^{-2}}{\left(\frac{3}{5}\right)^2}$ [5 marks]

Question No.2

a) Use factor theorem to factorise the expression given: [5 marks]
$y=2x^3-x^2-16x+15$

b) Make the symbols indicated the subject of the formulae and express each in its simplest form.

$\frac{x}{y}=\frac{1+r^2}{1-r^2}$ *(r)* [5 marks]

c) Solve the given equation: $8x^2+2x-15=0$ [2 marks]

Question No.3

Resolve the following into partial fractions:

a) $\dfrac{x^2-3x+6}{x(x-2)(x-1)}$ [6 marks]

b) $\dfrac{x^2+7x+3}{x^2(x+3)}$ [6 marks]

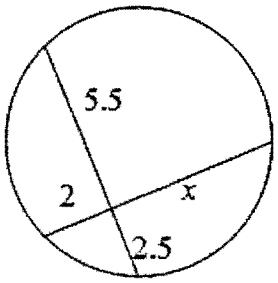
Question No.4

Solve the given equations:

a) $\log(x^2-5)-\log x=\log 4$ [5 marks]

b) $\log_3 x=-2$ [3 marks]

c) Find the value of x in the following diagram: [2 marks]



Question No.5

a) Convert 125°47′ to radians. [2 marks]

b) The equation of the circle is: $x^2 + y^2 + 12x - 4y + 4 = 0$. Determine the diameter of the circle and the coordinates of the centre of the circle. [3 marks]

c) Determine the shaded area in Figure RT5.2, correct to the nearest square centimeter.

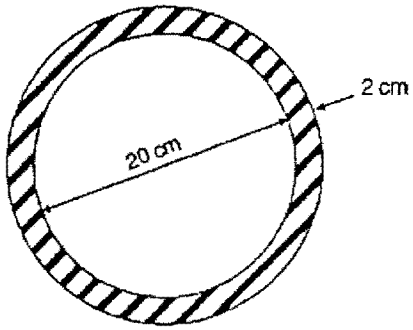


Figure RT5.2 [4 marks]

Question No.6

a) Suppose the cost to produce 10 units of a product is \$40 and the cost of 20 units is \$70. If cost c is linearly related to output q, find a linear equation relating C and q. Find the cost to produce 35 units. [5 marks]

b) Plot the graph of $y = -2x^2 + 3x + 6$ showing all the intercepts clearly. [8 marks]

c) One line passes through the points (–1, –2) and (1, 2); another line passes through the points (–2, 0) and (0, 4). Are these lines parallel, perpendicular, or neither? [3 marks]

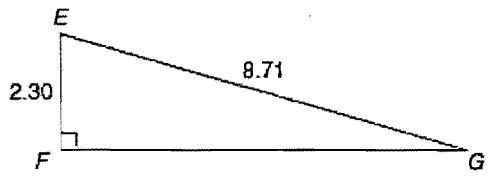
d) A sinusoidal waveform is given by $v = 415\sin(50\pi t - 0.541)$ Volts.
Find the amplitude, periodic time, frequency, and phase angle, stating whether it is leading or lagging $\sin(wt)$. [5 marks]

Question No.7

a) Evaluate the following using surd form: $(\tan 45°)(4\cos 60° - 2\sin 60°)$ [4 marks]

b) Express the given Cartesian coordinates (-5.4, 3.7) as polar coordinates correct to 2 decimal places: [4 marks]

c) Solve the triangle: [4 marks]



d) Prove the following identities: $\sqrt{\dfrac{1-\cos^2\theta}{\cos^2\theta}} = \tan\theta$ [4 marks]

Question No.8

a) Evaluate the definite integral: $\int_1^2 4\cos 3t \cdot dt$ [5 marks]

b) The distance x metres travelled by a vehicle in time t seconds after the brakes are applied is given by: $x = 20t - \dfrac{5}{3}t^2$. Determine

(i) The speed of the vehicle at the instant the brakes are applied

(ii) The distance the car travels before it stops [5 marks]

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THE END

Trig Cheat Sheet

Tangent and Cotangent Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Reciprocal Identities

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sin\theta = \frac{1}{\csc\theta}$$

$$\sec\theta = \frac{1}{\cos\theta} \qquad \cos\theta = \frac{1}{\sec\theta}$$

$$\cot\theta = \frac{1}{\tan\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$