



# **EEE 401: Mathematics for Technicians I Final Examination**

**College of Engineering Science & Technology**

**Trade Diploma in Electrical & Electronics Engineering**

**School of Mathematical and Computing Sciences**

**Semester 1, 2016**

Time: 3 hours, 10 Minutes

## **Instructions:**

1. **There are total of 12 questions in the paper. Answer any 10. Each question is worth 10 marks.**
2. You are permitted 10 minutes of reading time in which you are NOT allowed to write.
3. **Answer each question on a new page in the answer booklet provided. Clearly number each problem you attempt. All relevant working must be shown.**
4. Students may use a calculator, provided it cannot be programmed. Phones, notes and other study aids are not permitted.
5. If you use extra sheets of paper, attached them securely to the answer sheet.
6. Write your student identity number at the top of every page used.
7. There are total of four pages.

### Question 1

a) Determine the value of:  $\frac{7}{6}$  of  $\left(3\frac{1}{2} - 2\frac{1}{4}\right) + 5\frac{1}{8} \div \frac{3}{16} - \frac{1}{2}$  [5m]

b) Simplify  $(x^2y^3z)(x^3yz^2)$  using Laws of indices and evaluate when  $x = \frac{1}{2}$ ,  $y = 2$  and  $z = 3$ . [5m]

### Question 2

a) Determine the amount of copper and zinc needed to make 99kg brass ingot if they have to be in the proportions copper: zinc: 8: 3 by mass. [4m]

b) Solve the simultaneous equation for  $p$  and  $q$ .

$$3p = 2q$$

$$4p + q + 11 = 0$$
 [6m]

### Question 3

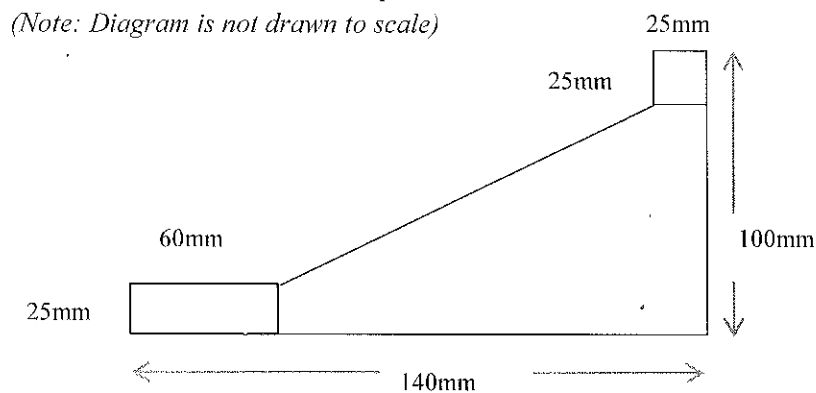
a) Transpose the formula  $v = u + \frac{ft}{m}$ , to make  $f$  the subject. [3m]

b) Evaluate  $\frac{\log 25 - \log 125 + \log 625}{3 \log 5}$  [4m]

c) Express  $\frac{3}{310}$  as a percentage, correct to 3 significant figures. [3m]

### Question 4

a) Calculate the area of the steel plate shown below: [6m]



- b) Determine the maximum capacity, in *litres* of a fish tank measuring  $50\text{cm} \times 40\text{cm} \times 2.5\text{m}$ .  
(1 litre =  $1000\text{cm}^3$ ) [4m]

### Question 5

- a) Determine the equation of the straight line which passes through the coordinates (2,7) and (-3,4) [5m]
- b) The value of alternating current,  $iA$ , in a circuit, after  $t$  seconds is given by  $i = 50\sin 100\pi t$ .  
Calculate:
- Amplitude, frequency and Period [3m]
  - the time when the current first reaches  $25A$  [1m]
  - the value of the current after  $0.055\text{s}$  [1m]

### Question 6

- a) A man travels  $7\text{km}$  due North and then  $5\text{km}$  due East. At the end of his journey find his bearing from the starting point. [5m]
- b) Solve for  $x$ :  $\sqrt{2} \cos 2x = 1$ , where  $0^\circ \leq x \leq 360^\circ$  [5m]

### Question 7

- a) Convert the following angles to radians [4m]
- $37.5^\circ$
  - $383^\circ 17' 23''$
- b) [4m]
- Add  $15^\circ 32'$  and  $17^\circ 19'$
  - Subtract  $29^\circ 13' 29''$  from  $47^\circ 8' 15''$
- c) Factorize  $px + qx + py + qy$  [2m]

### Question 8

- a) Find the limit: [5m]

$$\lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x - 3}$$

- b) Convert (3,4) into polar form. [5m]

### Question 9

Differentiate the following with respect to  $x$ .

i.  $f(x) = \sqrt{5x}$  [3m]

ii.  $f(x) = \frac{2x-1}{x+3}$  [4m]

iii.  $f(x) = \frac{6}{x^5}$  [3m]

### Question 10

- a) Use the definition of the derivative to find the derivative of  $f(x) = x^2 + 1$ . [6m]

- b) Evaluate: [4m]

$$\int_1^2 4e^{2x} dx$$

### Question 11

- a) Find the differential coefficient of:  $y = 10\sin 2x + \ln(1+x) + e^{(x-3x)}$  [6m]

- b) Find the area under the graph  $3x^2 + 2x$  for the interval  $[0, 2]$ . [4m]

### Question 12

- a) Evaluate:  $\int x^2 e^x dx$  [10m]

**THE END**