Science and Engineering Foundation Programme
Mid-Semester Module Assessment

SEF001& MED3001 - Mathematics I

Tuesday 6 November 2018, 11.00am

Time Allowed: 50 minutes

Note:

The mark will be calculated from **the best FOUR** questions out of **FIVE**.

All questions carry equal marks.

FULL NAME:

STUDENT ID:

TUTOR GROUP:

Instructions:

DO NOT TURN OVER THE SCRIPT until the test has started.

Make sure you read all questions carefully.

CALCULATORS:
Only Casio fx-82, fx-83 and fx-85 are allowed (+ extensions like ES, GT, GT plus).

For marking purposes only:

Question	Marks	Comments
1		
2		
3		
4		
5		
TOTAL :		

1. (a) Solve:

$$\log_2 \sqrt{x} + \log_4 x = 5.$$

[10]

(b) Find the two real values of x satisfying:

$$x - xe^{5x+2} = 0.$$

[15]

2. The sum of the remainders when $x^2 + 7x + (k - 20)$ is divided by $(x + 4)$ and $4x^2 + (k - 13)$ is divided by $(x - 3)$ is 15. Find the value of k.

3. (a) Find the points with x coordinate $x = 2$ lying on the circle specified by the equation

$$(x - 1)^2 + y^2 = 16.$$

And find the equations of the tangents at these points.

[12]

(b) Determine the centre and radius of the circle specified by the equation

$$x^2 + y^2 - 4x + 6y = 23.$$

Show that the point $P = (2, 3)$ lies on the circle. What is the equation of the radial line CP?

[13]

4. (a) The distance of a point P from the line $4x - 3y = 1$ is equal 5 units. Derive an equation specifying the loci of all P with this property.

[10]

(b) Find the equation of the perpendicular bisector of AO line segment where O is the origin and $A = (2, 4)$.

[15]

5. Functions $f(x)$ and $g(x)$ are specified as

$$f(x) = \frac{1}{1 + x} \qquad \text{and} \qquad g(x) = 2x^2 - 1.$$

(a) Specify the domain and range for $f(x)$ and $g(x)$.

[6]

(b) Specify if functions $f(x)$ and $g(x)$ are odd, even or neither.

[9]

(c) What is the domain and range so that $f(x)$ and $g(x)$ become invertible?
Find the inverse functions $f^{-1}(x)$ and $g^{-1}(x)$ and specify the domain and range of the inverse functions.

[10]

End of Assessment