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**A. M. E. C. E. A**

**MAIN EXAMINATION**

**JANUARY – APRIL 2022**

**FACULTY OF SCIENCE**

**DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE**

**REGULAR PROGRAMME**

**DMAT 100: BASIC MATHEMATICS**

**DCHD 113: COLLEGE MATHEMATICS**

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| **Date: APRIL 2022 Duration: 2 Hours** |
| **INSTRUCTIONS: Answer Question ONE and any TWO Questions** |

Q1

1. Solve the equation

$$log (x^{2}-5)-log x=log 4$$

 **(4 marks)**

1. The sum of 7 terms of an Arithmetic Progression is 35 and the common difference is 1.2. Determine the first term of the series.

 **(3 marks)**

1. Evaluate

$$\frac{log 25-log 125+\frac{1}{2} log 625}{3 log 5}$$

 **(3 marks)**

1. Three numbers are in arithmetic progression. Their sum is 15 and their product is 80. Determine the three numbers.

 **(4 marks)**

1. Simplify

$$\frac{a^{2}b+a^{3}b}{a^{2}b^{2}}$$

 **(3 marks)**

1. Determine the quotient and remainder when the polynomial $x^{2}+3x –2$ is divided by $\left(x-2\right)$.

 **(3 marks)**

1. Evaluate .

 **(3 marks)**

1. Solve $10x^{2}+6x+15=0$

**(3 marks)**

1. Express $\frac{\left(6+i\right)\left(2-i\right)}{\left(4+3i\right)\left(1-2i\right)}$ in the form $a+ib$

**(4 marks)**

Q2.

1. Find the middle term of

$$\left(2p-5q\right)^{10}$$

**(5 marks)**

1. The first, twelfth and last term of an arithmetic progression are $4$, $31\_{2}^{1}$, and $376\_{2}^{1}$ respectively. Determine
2. the number of terms in the series,

**(2 marks)**

1. the sum of all the terms

**(2 marks)**

1. Given , illustrate that 

**(5 marks)**

1. Determine the remainder when $\left(x^{3}-2x^{2}-5x+6\right)$ is divided by:
2. $\left(x-1\right)$ and
3. $\left(x+2\right)$. Hence factorize the cubic expression.

**(6 marks)**

Q3.

1. A shed is 4.0m long and 2.0m wide. A concrete path of constant width is laid all the way around the shed. If the area of the path is $9.50 m^{2}$ calculate its width to the nearest centimetre.

**(5 marks)**

1. Solve  by completing the square method

**(5 marks)**

1. Use the factor theorem to determine the factors of $\left(x^{3}-2x^{2}-5x+6\right)$ and hence solve the cubic equation $x^{3}-2x^{2}-5x+6=0$

**(6 marks)**

1. Find the number of terms of the series 5, 8,11, . . . of which the sum is 1025.

**(4 marks)**

Q4.

1. The resonant frequency of a vibrating shaft is given by: $f=\frac{1}{2π}\sqrt{\frac{k}{l}}$ where k is the stiffness and $l$ is the inertia of the shaft. Use the binomial theorem to determine the approximate percentage error in determining the frequency using the measured values of $k$ and $l$ when the measured value of $k$ is 4% too large and the measured value of $l$ is 2% too small.

**(6 marks)**

1. Let and ,compute . Hence determine 

**(5 marks)**

1. Given the roots of a quadratic equation as  and determine the quadratic equation in y.

**(3 marks)**

1. Determine the value of $\left(3.039\right)^{4}$, correct to 6 significant figures using the binomial theorem.

**(6 marks)**

Q5.

1. Using the following functions $f\left(x\right)=7x+\frac{2}{3}$ and $g\left(x\right)=2x^{2}+4x+5$ show that
2. $\left(f∘g\right)^{-1}\left(x\right)=\left(g^{-1}∘f^{-1}\right)\left(x\right)$

**(6 marks)**

1. $\left(g∘f\right)^{-1}\left(x\right)=\left(f^{-1}∘g^{-1}\right)\left(x\right)$

  **(6 marks)**

1. A committee of 5 people is to be chosen from a group of 6 men and 4 women. How many committees are possible?
2. If there to be 3 men and 2 women?

 **(4 marks)**

1. If the majority have to be women?

 **(4 marks)**

**\*END\***