NTU UEE 2019

MATHEMATICS at A – LEVEL

INSTRUCTIONS **Time Allowed: 2 Hours**

1. This paper consist of 4 questions and comprises 2 pages
2. Write down your answers in the provided answer sheet.
3. Answers will be graded for content and appropriate presentation

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❖ *Question 1*

(a) Find the minimum value of the function $f(x) = x^2 + |x - a| + 1$, in terms of a!

(b) Given a function of $f(x) = \cos x \left(\sin x - \sqrt{3}\cos x\right) - \frac{\sqrt{3}}{2}$

(i) Find the minimum positive period of the function!

(ii) Find the interval of x where $f(x)$ is increasing monotonically!

❖ *Question 2*

(a) The probability of Eric winning a game is 0.6, while Daniel is 0.4. The first player to win 3 games out of 5, wins the tournament. Find the probability that Eric win the game.

(b) Three red balls and seven white balls are placed inside a box. Two balls will be picked without replacement. Given that one of the balls is red, find the probability that the second ball is:

(i) Red

(ii) White

(c) The probability of someone's life span in particular town is $f(x) = 0.01e^{-0.01x}$. Find the probability of 3 independent person that:

(i) All live ≥ 100 years

(ii) All live < 100 years

❖ *Question 3*

(a) Given that $z_i - \frac{25}{z_i}$ is imaginary number and $|z_i - 3| = 4$, find z_i!

(b) Given that $|z - z_0| \leq 1$, where $z_0 = -1 - i$, find the probability that $x + y > -1$.

(c) Given that $|a| = 3$ and $|b| = 2$, the angle between a and b is 120°, and that $(ka - b)$ and $(a - kb)$ are perpendicular, find the value of k!

❖ *Question 4*

(a) Solve the following integral,

$$\int \frac{dx}{2x^2 + 1\sqrt{x^2 + 1}} = \cdots$$

(b) Solve the following integral,

$$\int x \sin^2(x^2 + 1)\, dx = \cdots$$

(c) Find y in term of x, from the given differential equation

$$x \frac{dy}{dx} = y(\ln y - \ln x)$$

(d) Find y in term of x, from the given differential equation

$$\frac{dy}{dx} + xy + xy^2 = 0$$