FUKIEN SECONDARY SCHOOL
S4 First Term Uniform Test (2020-2021)
Mathematics Extended Part Module 1
(1 hour 15 minutes)

Date: 23rd October 2020   Name:_____

Time: 8:30 a.m. - 9:45 a.m.   Class: _____ No.: _____

Instructions to students:

1.   The maximum score of this paper is 53.

2.   Attempt ALL questions. Write your answers on the single-lined paper.

3.   Unless otherwise specified, show your workings clearly.

4.   Unless otherwise specified, numerical answers should be either exact or given to 4 decimal places.

5.   The diagrams in this paper are not necessarily drawn to scale.

1   Let $\displaystyle\sum_{i=1}^{5} x_i = 5$, $\displaystyle\sum_{i=1}^{5} y_i = 12$, $\displaystyle\sum_{i=1}^{5} x_i^2 = 17$, $\displaystyle\sum_{i=1}^{5} y_i^2 = 30$ and $\displaystyle\sum_{i=1}^{5} x_i y_i = 24$. Calculate the following.

(a) $\displaystyle\sum_{i=1}^{5}(3x_i - 1)$ (b) $\displaystyle\sum_{i=1}^{5}(2x_i + 3y_i)$ (c) $\displaystyle\sum_{i=1}^{5}(5x_i + 4y_i)^2$

(3 marks)

2. Find the amount accumulated at the end of 5 years for $10000 at 6 % if interest is compounded

(a) annually,

(b) monthly,

(c) continuously.

(correct your answers to the nearest dollar.)

(3 marks)

3. (a) Simplify $\dfrac{(n+1)!}{2!(n-1)!}$.

(b) Hence, solve $4C_2^{n+1} + C_{n-1}^{n} = 152$.

(5 marks)

4. (a) Expand $(2+x)^3$ in ascending powers of x

(b) Expand $e^x(2+x)^3$ in descending powers of x up to the term x^3.

(4 marks)

5. It is given that $(1+kx)^7 = 1 + bx + 84x^2 +$ terms involving higher powers of x, where $k < 0$ and $b \neq 0$. Find the values of k and b.

(4 marks)

6. Given that in the expansion of $\left(x^2 + \dfrac{3}{x}\right)^n$ in descending powers of x, where n is a positive integer, the 7th term is the constant term. Find n and the constant term.

(4 marks)

7. Let $y = ae^{bx}$, where a and b are constants.

(a) By expressing $\ln y$ as a linear function of x.

(b) It is given that the intercepts of the horizontal axis and the vertical axis of the graph of the linear function obtained in (a) are 0.77 and -2.3 respectively. Find the values of a and b correct to 1 decimal place.

(4 marks)

8. Solve each of the following equations.
    (a) $\ln(5x+1) - \ln(5x-4) = \ln 2$.
    (b) $e^x + 4e^{-x} = 5$.

    (5 marks)

9. (a) Expand e^{-6x} in ascending powers of x as far as the term in x^2.

    (b) If the coefficient of x^2 in the expansion of $\dfrac{(3+kx)^6}{e^{6x}}$ is 486, where k is an integer, find the

         value of k.

    (5 marks)

10. After adding a chemical into a solution, the temperature $T(t)\,^\circ C$ of the solution can be
     modelled by $T(t) = (t+1)^2 e^{-\lambda t} + k$, where t (≥ 0) is the time measured in seconds after the
     chemical has been added and λ, k are constants. It is given that $T(9) = T(19)$.
     (a) Find λ in terms of natural logarithms.
     (b) Furthermore, it is given that $T(5) = 50$.
          (i)   Find the value of k.
          (ii) Find the temperature of the solution 10 seconds after the chemical has been added.

     (7 marks)

11. (a) Expand $(1 + ax)^2(1+ bx)^7$ in ascending powers of x as far as the term in x^2.

     (b) If the coefficients of x and x^2 in the expansion in (a) are $\dfrac{-5}{2}$ and $\dfrac{-27}{4}$ respectively,

          (i)   find the values of a and b,
          (ii) find the coefficient of x in the expansion of $(1 + ax)^3(1 + bx)^7$ where $b > 0$.

     (9 marks)

END OF PAPER