Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

FIVE-SEMESTER BACHELOR OF EDUCATION (SANDWICH) PROGRAMME
LEVEL 400, END-OF-FIRST SEMESTER EXAMINATIONS, JANUARY 2024

8TH JANUARY 2024   ORDINARY DIFFERENTIAL EQUATIONS   2:40 PM - 4:00 PM

SECTION B
(40 MARKS)

Answer any TWO questions from this Section.
Please, note that if you answer more than two questions, only the first two will be marked.

1.
   a. Find the general solution of the following non-homogeneous equation
$t^4 y'' + t^3 y' - 4t^2 y = 1$, given that $y_1 = t^2$ is a solution of the associated homogeneous equation.

   b. Find every solution y of the differential equation $3t^2 + 4y^3 y' - 1 + y' = 0$. Leave the solution in implicit form.

$$3t^2 + 4y^3 y' + y' + 1 = 0$$

2.
   a. Find the function y solution of the initial value problem $ty' + 2y = 4t^2, t > 0, y(1) = 2$.

   b.

      i. Find the differential equation satisfied by the family of functions:
$y(t) = \frac{c_1}{t} + c_2 t,$
$c_1, c_2 \in R.$

     ii. Verify that $y_1 = \cos(2t)$, $y_2 = \sin(2t)$ are fundamental set for $y'' + 4y = 0$. Hence or otherwise, write down the general solution of $y'' + 4y = 0$.

3.

    a.   Find all solutions of $y' = -4y + 2$

    b.   Solve $9y'' + 6y' + y = 0$, given that $y(0) = 1$, $y'(0) = \frac{5}{3}$.

4.

    a.   Given differential equation $y'' + 4y = 0$, verify whether the following functions y_1, y_2 are its fundamental set of solutions: $y_1(t) = cos(2t)$, $y_2(t) = sin(2t)$.

    b.   Find the explicit solution to the initial value problem $(t^2 + 2ty)y' = y^2, y(1) = 1$.