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QUALIFICATIONS: **BACHELOR of SCIENCE IN APPLIED MATHEMATICS AND STATISTICS AND BACHELOR OF SCIENCE**	
QUALIFICATION CODES: **07BSAM, 07BSOC**	LEVEL: **6**
COURSE: **ORDINARY DIFFERENTIAL EQUATIONS**	COURSE CODE: **ODE602S**
DATE: **JANUARY 2025**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER

EXAMINER: ***Prof Adetayo S. Eegunjobi***

MODERATOR: ***Prof Sunday A. Reju***

INSTRUCTIONS:

1. Answer **ALL** questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS

1. Non-Programmable Calculator

ATTACHEMENTS

1. None

This paper consists of 2 pages including this front page

1. Solve the following ordinary differential equations
   (a) $2(x-y)+y'(x)=(y-(x+1))^2, \quad y_1(x)=x$ (9)
   (b) $xdy+(y-x^3y^6)dx=0$ (9)
   (c) By variation of parameter $x^2y''(x)+xy'(x)-y(x)=\ln x$ (9)

2. (a) Solve the initial-value problem by using the power series method and obtian the first six terms $(x^2+1)y''(x)+2xy'(x)=0, \quad y(0)=0, \quad y'(0)=1$ (15)
   (b) Find the general solution of $x^2y''(x)+xy'(x)+\left(x^2-\frac{4}{9}\right)y(x)=0$ by using Frobenius method at about $x=0$. (15)

3. (a) Use convolution theorem to find the inverse transform of
$$\frac{s}{(s^2+1)(s^2+4)}.$$
(7)
   (b) Find the following Laplace transform
$$\mathcal{L}\{\cos t\cos 2t\cos 3t\}$$
(8)
   (c) Find
$$\mathcal{L}\left\{e^{-2t}\int_0^t e^{2\tau}\cos 3\tau d\tau\right\}$$
(8)

4. (a) Solve the following using Laplace Transform
$$x'(t)-y(t)=e^t, \quad y'(t)+x(t)=\sin t, \quad x(0)=1, \quad y(0)=0$$
(10)
   (b) Find
$$\mathcal{L}^{-1}\left\{\frac{3s+8}{s^2+2s+5}\right\}$$
(10)

End of Exam!