



DEPARTMENT OF MATHEMATICS/ICT

EDO UNIVERSITY, IYAMHO

SECOND SEMESTER EXAMINATION 2015/2016

instruction: Answer any five(5) questions

Time allowed: 2 hr. 30 mins

MTH 124- INTRODUCTION TO DIFFERENTIAL EQUATIONS AND DYNAMICS

- (1) a. What do you understand by an **ordinary differential equation**.
b. Explain the concept of **order and degree** of differential equations.
c. Find the degree and order of the equations below, show your workings;

i. $\sec x = y \sqrt{\frac{dy}{dx}}$

ii. $\left(1 + \frac{dy}{dx}\right)^{\frac{5}{3}} = C \frac{d^2y}{dx^2}$

iii. $\left(\frac{d^3y}{dx^3}\right)^5 + 6 \frac{d^2y}{dx^2} + x \left(\frac{dy}{dx}\right)^7 = 0$

(2) a. Solve $x^3 dx + (y + 1)^2 dy = 0$

b. Solve $x^2(y + 1)dx + y^2(x - 1)dy = 0$

c. Solve $ydx + (x^2 - 4x)dy = 0$

- (3) a. The **necessary** and **sufficient** condition that $M(x, y)dx + N(x, y)dy = 0$, be **exact** is?

b. Solve $(y^2 + y)dx - xdy = 0$, using $\frac{1}{y^2}$ as an integrating factor. **Hint:** $\frac{ydx - xdy}{y^2} = d\left(\frac{x}{y}\right)$, for **exact differentials**.

- (4) a. Solve $ydx + xdy = 0$, using $\frac{1}{xy}$ as an integrating factor. **Hint:** $\frac{ydx + xdy}{xy} = d(\ln xy)$, for **exact differentials**.

b. Solve $\frac{dy}{dx} + 2xy = 4x$.





(5) a. Solve $(x - 2) \frac{dy}{dx} = y + 2(x - 2)^3$.

b. Solve $\frac{dy}{dx} + y \cot x = 5e^{\cos x}$. Find the Particular solution, given the initial conditions: $x = \frac{1}{2}\pi, y = -4$.

(6) a. Solve the initial value problem. $x \frac{dy}{dx} - 4y = x^5, y(1) = 2$.

b. Solve $\frac{dy}{dx} - y = 3$.

(7) a. Solve $2 \frac{d^2y}{dx^2} + 5 \frac{dy}{dx} - 12y = 0$

b. Solve $\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} - 10y = 0$; when $x = 0, y = 3$ and $\frac{dy}{dx} = 8$.

c. Solve $\frac{d^2\theta}{dt^2} - 14 \frac{d\theta}{dt} + 49\theta = 0$, when $t = 0, \theta = 2, \frac{d\theta}{dt} = 9$.

