LAGOS CITY POLYTECHNIC, IKEJA

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

DEPARTMENT OF ELECT/ELECT AND COMPUTER ENGINEERING

2016/2017 SEMESTER EXAMINATION

COURSE TITLE: ADVANCE CALCULUS NO OF QUESTIONS : 6
COURSE CODE: MTH 312 TIME ALLOWED: 3HRS
FOR WHOM: HND YR II CS PT INSTRUCTIONS: ATTEMPT ANY FOUR QUESTIONS.

1. (a) (i) Define the laplace transform of the function f(x).
   (ii) Derive the laplace transform of C^{-at}.

   (b) Find the inverse laplace of $\frac{15}{s^2 + 4s + 13}$

   (c) Using the definition of laplace transform, derive L {coskt}

2. (a) (i) Explain with examples the two classes of differential equation
   (ii) Classify the following differential equations according to order, degree, whether linear or non-linear

   $\frac{dy}{dx} + x^2 y = xe^x$

   $\frac{d^3y}{dx^3} + 2\left(\frac{d^2y}{dx^2}\right) + 3y = 0$

   (b) Solve the differential equation $\frac{dy}{dx} = 2y\,1$ given the initial condition $y = 1$ at $x = 0$

3. (a) Solve $x\,dy = (y + 1)\,dx$ using separation of variable.
   (b) Classify the partial differential equation below as Hyperbolic, parabolic, or elliptic

   (i) $3\left(\frac{\partial^2 4}{\partial x^2}\right) + 2\left(\frac{\partial^2 4}{\partial x \partial y}\right) + \left(\frac{\partial^2 y}{\partial y^2}\right)$

   (ii) $\left(\frac{\partial^2 y}{\partial x^2}\right) + 8\left(\frac{\partial^2 u}{\partial x \partial y}\right) + 2\left(\frac{\partial^2 u}{\partial y^2}\right) = 0$

4. (a) Show that $y = \cos 2x + \sin 2x$ is the solution to the differential equation $y^{11} + 4y = 0$.

   (b) Find $L^{-1}\{f(s)\}$ of the function $\frac{1}{(s-2)(s+4)}$

   (c) Verify that $y = e^x + e^{2x} + xe^{2x}$ is a zero of the differential equation given by $y^{11} - 3y^1 + 2y = e^{2x}$

5. (a) Derive the laplace transform of first and second derivatives

   (b) Prove that the transform of F(t) up to n derivative is given by