CLASS:    IMSC                                                                    SEMESTER : II
BRANCH:   MATHS & COMPUTING                                                       SESSION : SP/22

**SUBJECT: MA106-ORDINARY DIFFERENTIAL EQUATION**

TIME:     3 Hours                                                                 FULL MARKS: 50

**INSTRUCTIONS:**
**1. The question paper contains 5 questions each of 10 marks and total 50 marks.**
**2. Attempt all questions.**
**3. The missing data, if any, may be assumed suitably.**
*4.* **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

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Q.1(a)   Find the orthogonal trajectories of the family of curves $r^n = a^n \cos n\theta$ where $a$ is a parameter    [5]
Q.1(b)   Find the general solution of the differential equation $p(p + x) = y(x + y)$.    [5]

Q.2(a)   Using the method of variation of parameters, find the general solution of $y'' + n^2 y = \operatorname{cosec} nx$.    [5]
Q.2(b)   Solve the differential equation $x^2 y'' - xy' = 12x \log x$.    [5]

Q.3(a)   Solve the differential equation $yzdx + xzdy + xydz = 0$, first showing that it is integrable.    [5]
Q.3(b)   Using Natani's method, solve the total differential equation:    [5]
$(x^2 + y^2 + z^2)dx - 2xydy - 2xzdz = 0$.

Q.4      Find the power series solution about the point $x = 0$ of the differential equation:    [10]
$y'' + xy' + x^2 y = 0$.

Q.5(a)   Using the Picard's method, find the first three approximations to the solution of initial value problem:    [5]
$y' = 1 + y^2$, y(0)=0.
Q.5(b)   Find the eigenvalues and eigenfunctions of the SLP:    [5]
$(x^3 y')' + \lambda xy = 0$, $y(0) = 0, y(1) = 0$.

**:::::19/07/2022:::::**