STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-86

(For candidates admitted during the year 2015 and thereafter)

SUBJECT CODE: 15MT/MC/ED55

B.Sc. DEGREE END SEMESTER EXAMINATION- NOVEMBER 2020

COURSE: MAJOR CORE **TIME: 90 MINUTES**

PAPER: ELEMENTS OF DIFFERENTIAL EQUATIONS **MAX.MARKS: 50**

SECTION – A

Answer **ALL** questions (3 × 2 = 6)

1. Find the complementary function of the differential equation $y'' - 7y' + 12y = x^2$
2. A mass of 2 kg is suspended from a spring with a known constant of 10N/m and allowed to come to rest. It is then set in motion by giving it an initial velocity of 150 cm/s. Find an expression for the motion of the mass, assuming no air resistance.
3. Differentiate between complete integral and particular integral of a partial differential equation.

SECTION – B

Answer any **THREE** questions (3 × 8 =24)

4. Find a particular solution y_p of $x^2y'' - 2xy' + 2y = x^{9/2}$, given that $y_1 = x$, $y_2 = x^2$ are solutions of the complementary equation of $x^2y'' - 2xy' + 2y = 0$.
5. Compute the coefficients $a_0, a_1, \ldots \ldots a_5$ in the series solution $\sum_{n=0}^{\infty} a_n x^n$ of the IVP $(1 + 2x^2)y'' + 10xy' + 8y = 0,\ y(0) = 2,\ y'(0) = -3.$
6. Rewrite the initial value problem $y_1' = y_1 + 2y_2 + 2e^{4t}$; $y_2' = 2y_1 + y_2 + e^{4t}$ in matrix form and verify that the vector function $y = \frac{1}{5}\begin{bmatrix}8\\7\end{bmatrix}e^{4t} + c_1\begin{bmatrix}1\\1\end{bmatrix}e^{3t} + c_2\begin{bmatrix}1\\-1\end{bmatrix}e^{-t}$ satisfies the system with initial condition $y(0) = \frac{1}{5}\begin{bmatrix}3\\22\end{bmatrix}$.
7. Solve $(z^2 - 2yz - y^2)p + (xy + zx)q = xy - xz$

SECTION –C

Answer any **ONE** question (1 × 20 =20)

8. a)Find a particular solution of $y'' - 4y' + 3y = e^{3x}(6 + 8x + 12x^2)$ by using the method of undetermined coefficients. (8)

   b) Find a fundamental set of Frobenius solutions of $x^2(3 + x)y'' + 5x(1 + x)y' - (1 - 4x)y = 0$. Give explicit formulas for the coefficients in the solutions. (12)

9. a) i) Find the complete integral of $p^2 + q^2 = x + y$ (4)

   ii) Solve $z = px + qy + c\sqrt{1 + p^2 + q^2}$ (8)

   b) Find the complete integral of $p^m sec^{2m}x + z^l q^n cosec^{2n}y = z^{\frac{lm}{m-n}}$ (8)