STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2015 – 16& thereafter)

SUBJECT CODE : 15MT/PC/DE14

M. Sc. DEGREE EXAMINATION, NOVEMBER 2016
BRANCH I - MATHEMATICS
FIRST SEMESTER

COURSE : CORE
PAPER : DIFFERENTIAL EQUATIONS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A **(5 X 2 = 10)**

ANSWER ALL QUESTIONS

1. Define Wronskian of two functions.
2. State Lipschitz condition.
3. Find a complete integral of $q = 3p^2$.
4. Define Boundary value problems.
5. Define Dirichlet problem.

SECTION – B **(5 X 6 = 30)**

ANSWER ANY FIVE QUESTIONS

6. If P_n is a legendre polynomial then prove that $\int_{-1}^{1} {P_n}^2(t)dt = \frac{2}{2n+1}$.
7. State and prove Abel's formula.
8. Find the complete integral of zpq=p+q by charpits method.
9. Reduce $\left(\frac{\partial^2 z}{\partial x^2}\right) = x^2\left(\frac{\partial^2 z}{\partial y^2}\right)$ to canonical form.
10. Derive one dimensional wave equation.
11. An insulated rod of length$l$has its ends A and B at 0^0c and 100^0c respectively until steady state conditions prevail .If B is suddenly reduced to 0^0c and maintained at 0^0c find the temperature at a distance x from A at time $'t'$.
12. Find the steady state temperature distribution in a thin rectangular plate bounded by the lines $x = 0,\ x = a,\ y = 0,\ y = b$. The edges $x = 0,\ x = a,\ y = 0$ are kept at temperature zero while the edge $y = b$ is kept at 100^0C.

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SECTION – C (3 X 20 = 60)

ANSWER ANY THREE QUESTIONS

13. Solve the Bessel equation $t^2x'' + tx' + (t^2 - p^2)x = 0$ of order p.

14. State and prove picard's theorem.

15. (a)Find a complete integral of $z^2 = pqxy$ by using charpits method.

(b)Reduce the equation $(n-1)^2\left(\frac{\partial^2 z}{\partial x^2}\right) - y^{2n}\left(\frac{\partial^2 z}{\partial y^2}\right) = n\, y^{2n-1}\left(\frac{\partial z}{\partial y}\right)$to canonical form.

16. (a)Obtain the general solution of heat flow equation $k\left(\frac{\partial^2 u}{\partial x^2}\right) = \frac{\partial u}{\partial t}$ by the method of separation of variables.

(b)Discuss D' Alembert's solution of wave equation.

17. Solve two dimensional Laplace equation in plane polar co-ordinates (r, θ).