

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted during the academic year 2011–12 & thereafter)

SUBJECT CODE: 11MT/MC/OD34

B. Sc. DEGREE EXAMINATION, NOVEMBER 2015

BRANCH I - MATHEMATICS

THIRD SEMESTER

COURSE : MAJOR – CORE

PAPER : ORDINARY DIFFERENTIAL EQUATIONS

TIME : 3 HOURS

MAX. MARKS : 100

SECTION-A

Answer All the questions

(10 x 2 = 20)

1. Solve $a(xdy + 2ydx) = xydy$.
2. Solve $y = (x - a)p - p^2$.
3. Find the complementary function of $(D^2 + 2D + 5)y = xe^x$.
4. Find the particular integral of $(D^2 + 4)y = xe^{2x}$.
5. Solve the equations $\frac{dx}{yz} = \frac{dy}{xz} = \frac{dz}{xy}$.
6. Write the conditions of integrability of equation $Pdx + Qdy + Rdz = 0$.
7. When a circuit is called over damped?
8. What is glucose tolerance test?
9. Mention some areas in the real world system, where the differential equations are applied.
10. Newton's which law is applied in coupled strings?

SECTION-B

Answer any FIVE questions

(5 x 8 = 40)

11. Solve $xp^2 - 2yp + x = 0$.
12. Find the orthogonal trajectories of the cardioids $r = a(1 + \cos\theta)$, where a being a parameter.
13. Solve $3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = x$.
14. Solve $(D^2 + 2D + 5)y = xe^x$.
15. Solve the equation $\frac{dy}{-y^2 - z^2} = \frac{dy}{xy} = \frac{dz}{xz}$.
16. Find the solution of the second order differential equation $\frac{d^2y}{dt^2} + \omega^2 y = 0$, describing free undamped motion.
17. Find the displacements of the two objects in the coupled spring mass system.

SECTION-C

Answer any TWO questions

(2 x 20 = 40)

18. a) Solve $p^2 + \left(x + y - 2\frac{y}{x}\right)p + xy + \frac{y^2}{x^2} - y - \frac{y^2}{x} = 0$.

b) Solve $(5 + 2x)^2 \frac{d^2y}{dx^2} - 6(5 + 2x) \frac{dy}{dx} + 8y = 6x$.

19. a) Solve $\frac{d^2y}{dx^2} + y = \sec x$ by the method of variation of parameters.

b) Show that equation

$$(x^2y - y^3 - y^2z)dz + (xy^2 - x^2z - x^3)dy + (xy^2 + x^2y)dz = 0$$

satisfies the condition of integrability and solve it.

20. a) Derive the equation of forced damping motion.

b) Explain the model for expenditure on Arms race by two countries and obtain the solution to the system.

