STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2008–09 & thereafter)

SUBJECT CODE : MT/MC/DL34

B. Sc. DEGREE EXAMINATION, NOVEMBER 2011
BRANCH I - MATHEMATICS
THIRD SEMESTER

COURSE : MAJOR – CORE
PAPER : DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A **(10 X 2 = 20)**
ANSWER ALL THE QUESTIONS

1. Solve: $p^2 - 5p + 6 = 0, p = \frac{dy}{dx}$.
2. Solve : $(D^2 - 4D + 3)y = 0$.
3. Form the PDE, by eliminating 'a' and 'b' from $z = (x^2 + a)(y^2 + b)$.
4. Form the PDE, by eliminating 'f' from $z = e^y f(x + y)$.
5. Solve $pq = 1$.
6. Solve: $\frac{\partial y}{\partial y} = \sin x$.
7. Prove that $L(e^{-at}) = \frac{1}{s+a}$, provided $s + a > 0$.
8. Find $L(t^2 e^{-3t})$.
9. Find $L^{-1}\left[\frac{s+3}{(s+3)^2+4}\right]$.
10. Find $L^{-1}\left[\frac{1}{(s-3)^5}\right]$.

SECTION – B **(5 X 8 = 40)**
ANSWER ANY FIVE QUESTIONS

11. Solve: $(D^2 - 4D + 3)y = e^x \cos 2x$.
12. Solve: $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 3y = x^2$.
13. Form the PDE, by eliminating 'f' from $f(x + y + z,\ x^2 + y^2 + z^2) = 0$.
14. Solve: $q^2 - p = y - x$.
15. If $L\{f(t)\} = F(s)$, then prove that $L\{tf(t)\} = -\frac{d}{ds}F(s)$.
16. Evaluate: $\int_0^\infty te^{-3t} \cos t \ dt$.
17. Find $L^{-1}\left[\frac{s-3}{s^2+4s+13}\right]$.

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SECTION – C **(2X20=40)**
ANSWER ANY TWO QUESTIONS

18. (i) Solve: $(D^2 - 2D + 1)y = x^2 e^{3x}$.

(ii) $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = \sin(\log x)$.

19. (i) Find the general solution of $x^2p + y^2q = (x + y)z$.

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

20. Solve: $y'' - 3y' + 2y = e^{2t}$, given that $y(0) = -3,\ y'(0) = 5$.