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

SUBJECT CODE : 15MT/MC/ML24

B. Sc. DEGREE EXAMINATION, APRIL 2017
BRANCH I – MATHEMATICS
SECOND SEMESTER

COURSE : MAJOR CORE
PAPER : MULTIPLE INTEGRALS AND LAPLACE TRANSFORMS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION A

Answer All Questions: **10 x 2 = 20**

1. Evaluate $\int_0^3 \int_1^2 xy\ (x+y)\ dydx.$
2. Evaluate $\int_0^a \int_0^b (x^2+y^2)\ dxdy.$
3. Write the definition of jacobian .
4. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2}\ dydx$.
5. Evaluate $\int_0^\infty e^{-x^2} dx.$
6. Define Beta function.
7. Prove that $L(Cosat) = \frac{s}{s^2+a^2}$
8. Find $L(t^3 - 3t^2 + 2).$
9. Find $L(te^{-t}sint).$
10. Find the inverse laplace transform of $\frac{1}{(s-3)^5}$

SECTION B

Answer Any Five Questions: **5 x 8 = 40**

11. By changing the order of integration evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dxdy.$
12. Evaluate $r^3 sin^2\theta drd\theta$ over the area of the circle $r = acos\Theta.$
13. Evaluate $\iint_R (x+y)^2\ dxdy$ where R is the parallelogram bounded by the lines

    $x + y = 0,\ x + y = 2,\ 3x - 2y = 0,\ 3x - 2y = 3.$
14. Evaluate $\int_0^\infty x^n e^{-ax} dx.$
15. $\int_0^{\frac{\pi}{2}} \sqrt{tan\theta}\ d\theta = \frac{\pi}{\sqrt{2}}.$
16. $L[cost\ cos2t].$
17. Find $L^{-1}\ \frac{1+2s}{(s+2)^2(s-1)^2}$.

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SECTION C

Answer Any Two Questions: **2 x 20= 40**

18. (i) Evaluate $\frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$ for all positive values of x, y, z for which the integral is real.

(ii) Evaluate $\iint_R (x-y)^4 e^{x+y}\, dxdy$ where R is the square with vertices $(1,0)$, $2,1$, $1,2$ and $(0,1)$.

19. (i) Show that $\Gamma n+1 = n\Gamma n$.

(ii) Show that $\frac{1.3.5.\ldots\ldots(2n-1)\pi}{2.4.6.\ldots\ldots 2n} = \frac{\Gamma n+\frac{1}{2}}{\Gamma n+1}$

20. (i) Find the laplace transform of $f(t) = e^{-t}$ when $0 < t < 4$
0 when $t > 4$

(ii) Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = 4e^{-t}$ given that $y = \frac{dy}{dt} = 0$ when $t = 0$