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

SUBJECT CODE : 15MT/AC/MP25

B. Sc. DEGREE EXAMINATION, APRIL 2016
BRANCH III – PHYSICS
SECOND SEMESTER

COURSE : ALLIED CORE
PAPER : MATHEMATICS FOR PHYSICS - II
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ALL QUESTIONS: **(10x2=20)**

1. Evaluate $\int_0^3 \int_1^2 xy\ (x+y)\ dydx$.
2. Evaluate $\int_0^{\frac{\pi}{2}} \int_0^a drd\theta$.
3. Evaluate $\int_0^b \int_0^a \int_0^{\sqrt{b^2-y^2}} xydydx$.
4. Evaluate $\int_0^a \int_0^b \int_0^c (x+y+z)\ dxdydz$.
5. Find $L\{sin4t\}$.
6. Find $L^{-1}\ \frac{s}{s^2-a^2}$.
7. Define conformal mapping.
8. State Taylor's series.
9. State Legendre differential equation.
10. Find the value of $P_1(1)$.

SECTION-B

ANSWER ANY FIVE QUESTIONS: **(5x8=40)**

11. Evaluate $(x^2+y^2)\ dxdy$ over the region for which x, y are each ≥ 0 and $x+y \leq 1$.
12. By changing into polar coordinates evaluate the integral $\int_0^{2a} \int_0^{\sqrt{2ax-x^2}} (x^2+y^2)dxdy$.
13. Given that $x+y = u$, $y = uv$, change the variables to u , v in the integral

    $[xy\ (1-x-y)\ ]^{\frac{1}{2}} dxdy$ taken over the area of the triangle with sides $x=0, y=0, x+y=1$ and evaluate it.

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14. Find $L\ \frac{cos3t-cos2t}{t}$.

15. Find $L^{-1}\ \frac{s^2}{s^2+4\ \ s^2+9}$.

16. Discuss the mapping $w = z^2$.

17. Solve Legendre's differential equation.

SECTION-C

ANSWER ANY TWO QUESTIONS: (2x20=40)

18. a) By changing the order of integration evaluate $\int_0^{\infty}\int_x^{\infty} \frac{e^{-y}}{y}\,dxdy$.

    b) By transforming into polar coordinates evaluate $\frac{x^2y^2}{x^2+y^2}\,dxdy$ over the annular region between the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = b^2$, $(b > a)$.

19. a) Solve, by using Laplace transform, $\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$ given that $y(0) = -2,\ y'\ 0\ = 5.$

    b) Find the poles of $f\ z\ = \frac{z^2+4}{z^3+2z^2+2z}$ and determine the residues at the poles.

20. a) Expand $f\ z\ = \frac{z}{z-1\ (z-2)}$ in a Laurent's series valid for

    (i) $z\ < 1$ and (ii) $1 <\ z\ < 2.$

    b) Obtain the Rodrigue's formula for Legendre's polynomials.

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