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

SUBJECT CODE : 15MT/AC/MP25

B. Sc. DEGREE EXAMINATION, APRIL 2018
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 $\int_1^2 \int_1^x x\, y^2 \; dydx$.
2. Evaluate $\int_0^a \int_0^b (x^2 + y^2) \; dxdy$.
3. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dxdy$.
4. By changing to polar coordinates find the value of the integral $\int\int (x^2 + y^2) \; dxdy$.
5. Find the Laplace transforms of L ($\cos^2 3t$).
6. Find the inverse Laplace transforms of L^{-1} $(\frac{s}{(s+2)^2})$.
7. Compare Taylor's and Laurent's series.
8. What is meant by Maclaurin's Series?
9. What does Regular Singularity means?
10. Write Legendre's differential equation.

SECTION-B

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

11. Find the value of $\int\int xy \; dxdy$ taken over the positive quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
12. By changing into coordinates evaluate the integrals $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2 + y^2} \; dydx$.
13. Find the inverse Laplace transforms $L^{-1}\left|\frac{1}{(s+1)(s^2+2s+2)}\right|$.
14. Find $L(t\, e^t \, sin2t)$.
15. Show that $\frac{1}{z^2} = 1 + \sum_{n=1}^{\infty}(n+1)(z+1)^n$ when $|z + 1| < 1$.
16. Find the residue of $\frac{e^z}{z^2(z^2+9)}$ at $z = 0$ and $z = 3i$.
17. Prove the orthogonality relation $\int_{-1}^{1} p_n(x)\, p_m(x)dx = 0$, if $m \neq n$.

..2

SECTION-C

ANSWER ANY TWO QUESTIONS: (2x20=40)

12. (a) Change the order of integration in the integral $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xydxdy$ and evaluate it.

(b) 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. (a) Using Laplace transforms solve $\frac{d^2y}{dt^2} - y = x^2 + x$ given that $y(0) = y'(0) = 0$.

(b) Find $L^{-1}(\frac{1}{(s^2+a^2)^2})$.

20. (a) Find the residue of $\frac{e^z}{z^2(z^2+9)}$ at its poles.

(b) Obtain the Rodrigue's formula for legendre polynomials.

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