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

SUBJECT CODE : 11MT/AC/MP24

B. Sc. DEGREE EXAMINATION, APRIL 2015
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. Obtain the partial differential equation by eliminating arbitrary constants a and b from $z = (x + a)(y + b)$.
2. Define complete integral.
3. Define Laplace transform of $f(t)$.
4. Find $L^{-1}\left(\frac{S-1}{(S-1)^2+4}\right)$.
5. Find the constant term of the Fourier series for $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ sinx, & 0 < x < \pi \end{cases}$.
6. Check whether the function $f(x) = x\,sin\,x$ is even or odd.
7. Evaluate $\lim_{z \to 2} \left(\frac{z^2-4}{z-2}\right)$.
8. State Cauchy's integral formula.
9. Write Taylor's series of $f(z)$ about the point z_0 .
10. Calculate the residue of $\frac{z+1}{z^2-2z}$ at $z = 2$.

SECTION-B

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

11. Solve $z^2(p^2 + q^2 + 1)$.
12. (a) Find $L(sin^3 2t)$.

    (b) Find $L^{-1}\left(\frac{2s+5}{s^2+4s+13}\right)$.
13. Expand the function $f(x) = x$ as a Fourier sine series in the interval $0 < x < \pi$.

14. Prove that an analytic function in a region with constant modulus is constant.

15. (a) Define singularity of a function and classify its types.

(b) Determine and classify the singular points of $f(z) = \frac{z - \sin z}{z^3}$.

16. Eliminate the arbitrary functions *f* and *g* from $= yf(x) + xg(x)$.

17. Evaluate $\int_C \frac{zdz}{z^2-1}$ using Cauchy's integral formula, where *C* is positively oriented circle $|z| = 2$.

SECTION-C

ANSWER ANY TWO QUESTIONS: **(2x20=40)**

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

(b) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$.

19. (a) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$ given that $y = \frac{dy}{dx} = 1$ at $x = 0$ using Laplace transform.

(b) Find the Fourier series for $f(x) = x^2$ in the interval $-\pi \le x \le \pi$.

20. (a) Prove that $u = 2x - x^3 + 3xy^2$ is harmonic and find its harmonic conjugate. Also find the corresponding analytic function.

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

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