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 2014
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. Form the partial differential equation by eliminating the arbitrary constants from $z = ax^3 + by^3$.
2. Find the complete integrals of the equation $p^2 + q^2 = m^2$.
3. Find $L(cos^2 t)$.
4. Find $L^{-1}\left(\frac{s+3}{s^2+6s+9}\right)$.
5. Find the Fourier coefficient a_0 for the function $f(x) = cos\, x, \ -\pi < x < \pi$.
6. Find the half range sine series for the function $f(x) = x$ in the interval $(0, \pi)$.
7. If $f(z)$ *and* $\overline{f(z)}$ are analytic in a region. Show that $f(z)$ is constant in that region.
8. Show that $u = x^3 - 3xy^2$ is a harmonic function.
9. Find the Taylor`s series for e^z about $z = 1$.
10. Find the order of the pole $z = 0$ in the relation $\frac{1-\sin z}{z^3}$.

SECTION-B

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

11. Form the partial differential equation by eliminating the arbitrary function $\emptyset$ from the relation $\emptyset(x^2 + y^2 + z^2, \ xyz)$.
12. Solve $z = p^2 + q^2$.
13. Find $L(cosht\ sin2t \ + \ t^2\, e^{-2t})$.

14. Find the Fourier series for the function $f(x) = \begin{cases} -k & -\pi < x < 0 \\ k & 0 < x < \pi \end{cases}$

15. Show that the function $u(x, y) = sinx\ coshy$ is harmonic. Find its harmonic conjugate $v(x, y)$ and the analytic function.

16. Let $f(z)$ be an analytic function. Prove that its real and imaginary parts are harmonic.

17. Find the residues of $\dfrac{z^2 - 2z}{(z+1)^2(z^2+4)}$ at the poles $z = -1$ and $z = 2i$.

SECTION-C

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

18. (a) Solve $(mz - ny)p + (nx - lz)q = ly - mx$.

 (b) Using Laplace transform solve $(D^2 + D)y = t^2 + 2t$ where $y(0) = 4, y'(0) = -2$.

19. Express $f(x) = (\pi - x)^2$ as a Fourier series of period 2π in the interval $0 < x < 2\pi$. Hence deduce the sum of the series $1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots$

20. (a) Solve $p^2 + q^2 = x^2 + y^2$.

 (b) Find the residue at z = 0 of the function $f(z) = \dfrac{1}{z + z^2}$

 (c) Prove that the limit of a function is unique.

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