

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086
(For candidates admitted during the academic year 2019–20 and thereafter)
SUBJECT CODE: 19MT/AC/MP15

B. Sc. DEGREE EXAMINATION – NOVEMBER 2021
BRANCH I - MATHEMATICS
FIRST SEMESTER

COURSE : ALLIED CORE
PAPER : MATHEMATICS FOR PHYSICS-I
TIME : 3 HOURS

MAX. MARKS: 100

SECTION – A

Answer **ALL** questions **(3 × 4 = 12)**

1. Find the eigen values for the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 3 \end{bmatrix}$.
2. Find the n^{th} differential coefficient of $\cos^2 x$.
3. Define an odd function and give an example.

SECTION-B

Answer any **THREE** questions **(3 × 16 = 48)**

4. Find the characteristic equation of $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & 1 \\ 2 & 1 & 2 \end{pmatrix}$ and hence find its inverse.
5. Evaluate $\int \sqrt{(x-3)(7-x)} dx$.
6. Solve: $(mz - ny)p + (nx - lz)q = ly - mx$.
7. Solve the following problem graphically:

$$\text{Max } Z = 8x_1 + 5x_2 \text{ subject to}$$

$$2x_1 + 2x_2 \leq 500$$

$$x_1 \geq 150$$

$$x_2 \geq 250$$

and

$$x_1, x_2 \geq 0$$

SECTION-C

Answer any **ONE** question **(1 × 40 = 40)**

8. a) Diagonalise the matrix: $\begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

b) Prove that if $y = ax \cos mx$, then $x^2(y_2 + m^2y) = 2(xy_1 - y)$

9. a) Show that as a cosine series in the half range 0 to π ,

$$\sin x = \frac{4}{\pi} \left(\frac{1}{2} - \frac{\cos 2x}{1.3} - \frac{\cos 4x}{3.5} - \frac{\cos 6x}{5.7} - \dots \right).$$

b) Solve the following linear programming problem by Simplex method:

$$\text{Maximize } Z = x_1 + x_2 + 3x_3$$

$$\text{Subject to } 3x_1 + 2x_2 + x_3 \leq 3$$

$$2x_1 + x_2 + 2x_3 \leq 2$$

$$x_1, x_2, x_3 \geq 0$$
