

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**  
**(For candidates admitted during the academic year 2019 – 20 & thereafter)**  
**B.S.C. DEGREE EXAMINATION, Dec 2020**  
**BRANCH I – MATHEMATICS**

**SUBJECT CODE:19MT/AC/MP15**

**PAPER: Mathematics for Physics-I**

**TIME : 90 minutes**

**MAX. MARKS: 50**

**Section – A**

**Answer all questions**

**(3 × 2 = 6)**

1. State Cayley Hamilton theorem.
2. If  $y = e^{-bx}$  then what is  $y_3$ ?
3. Find the complete integral of  $z = px + qy - 2p - 3q$ .

**Section – B**

**Answer any three questions**

**(3 × 8 = 24)**

4. Find  $y_n$  when  $y = \tan^{-1} \frac{x}{a}$ .
5. Solve:  $\sqrt{p} + \sqrt{q} = 2x$ .
6. Expand  $f(x) = \begin{cases} 0 & 0 < x < \frac{\pi}{2} \\ c & \frac{\pi}{2} < x < \pi \end{cases}$  in a sine series valid when  $0 \leq x \leq \pi$ .
7. A firm manufactures two products A and B on which the profits earned per unit are Rs. 3 and Rs. 4 respectively. Each product is processed on two machines  $M_1$  and  $M_2$ . Product A requires one minute of processing time on  $M_1$  and two minutes on  $M_2$ , while B requires one minute on  $M_1$  and one minute on  $M_2$ . Machine  $M_1$  is available for not more than 7 hours 30 minutes while machine  $M_2$  is available for 10 hours during any working day. Using graphical method, find the number of units of product A and B to be manufactured so as to maximize the profit.

**Section – C**

**Answer any one question**

**(1 × 20 = 20)**

8. (a) Find the eigen values and eigen vectors of the matrix  $\begin{pmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{pmatrix}$ .
- (b) Prove that  $\int_2^3 \sqrt{(x-2)(3-x)} dx = \frac{\pi}{8}$ .

**(10+10)**

9. (a) Determine the Fourier expansion of the function  $f(x) = x^2$  in the interval  $-\pi \leq x \leq \pi$ .

(b) Solve using simplex method: Maximize  $z = 2x_1 + x_2$ , subject to  
 $4x_1 + 3x_2 \leq 12$ ,  
 $4x_1 + x_2 \leq 8$ ,  
 $4x_1 - x_2 \leq 8$  and  $x_1, x_2 \geq 0$ .

**(10+10)**

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