

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086**  
(For candidates admitted from the academic year 2004-05 & thereafter)

SUBJECT CODE : MT/AO/BM23

**B. Sc. DEGREE EXAMINATION, APRIL 2007**  
**SECOND SEMESTER**

**COURSE : ALLIED OPTIONAL**  
**PAPER : BASIC MATHEMATICS**  
**TIME : 3 HOURS**

**MAX. MARKS : 100**

**SECTION – A**  
**ANSWER ALL QUESTIONS**

**10X2=20**

1. If A and B are orthogonal then prove that AB also is orthogonal.
2. If A is real and skew-symmetric matrix then prove that  $\bar{A}$  is skew Hermitian.
3. Differentiate  $e^{\sin^{-1}x}$  with respect to  $\sin^{-1}x$ .
4. Find  $\frac{d}{dx} \left( \frac{\log x}{\sin x} \right)$
5. Find  $\frac{du}{dt}$  if  $u = x^3 y^4 z^2$  where  $x = t^2$ ,  $y = t^3$ ,  $z = t^4$ .
6. Prove that  $\int_{-a}^a f(x)dx = 2 \int_0^a f(x)dx$  if f(x) is an even function.
7. Evaluate  $\int \frac{dx}{x^2 + a^2}$
8. Evaluate  $\int x^3 e^{ax} dx$
9. State the properties of correlation coefficient.
10. Write down the equations of the two regression lines for a bivariate data.

**SECTION – B**  
**ANSWER ANY FIVE QUESTIONS**

**5X8=40**

11. If A is a square matrix. Show that  $A+A^*$ ,  $AA^*$ ,  $A^*A$  are all Hermitian and  $A-A^*$  is Skew Hermitian.

12. Find the rank of the matrix  $A = \begin{pmatrix} 1 & 1 & 1 & -1 \\ 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 2 \end{pmatrix}$

13. (i) If  $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots}}}$  to infinity. Find  $\frac{dy}{dx}$ . (4)

(ii) Differentiate  $\log \sec^{-1}(x^4)$  (4)

14. (i) Verify Euler's theorem for the function  $U = \frac{x-y}{x+y}$ . (4)

(ii) If  $f(x, y) = \log \sqrt{x^2 + y^2}$  show that  $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0$  (4)

15. Evaluate (i)  $\int \frac{2x+3}{x^2+5x+7} dx$  (6)

(ii)  $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$  (2)

16. Prove that  $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx = \frac{\pi^2}{4}$

17. Calculate the rank correlation coefficient from the following data showing ranks of 10 students in Mathematics and Geometrical Drawing.

Maths	3	8	9	2	7	10	4	6	1	5
G.D.	5	9	10	1	8	7	3	4	2	6

**SECTION – C**  
**ANSWER ANY TWO QUESTIONS**

**2X20=40**

18. a) Show that the equations  $x + y + z = 6$ ,  $x + 2y + 3z = 14$ ,  $4 + 4y + 7z = 30$  are consistent and solve them. (12)

b) Find the inverse of the matrix  $\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$  (8)

19. a) If  $u = \sin^{-1} \left( \frac{x^3 + y^3}{\sqrt{x} + \sqrt{y}} \right)$  prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{5}{2} \tan u$ . (8)

b) Evaluate  $\int e^x \sin x dx$  (6)

c) Evaluate  $\int \frac{2x+2}{\sqrt{x^2+4x+7}} dx$  (6)

20. a) Compute Karl Pearson's coefficient of correlation from the following data.

Marks in Accountancy	77	54	27	52	14	35	90	25	56	60
Marks in English	35	58	60	40	50	40	35	56	34	42

(10)

- b) Calculate the regression equations of X on Y and Y on X from the following data and estimate X when Y = 26.

X	10	12	13	17	18	20	24	30
Y	5	6	7	9	13	15	20	21

(10)



