

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2006 – 07 & thereafter)

SUBJECT CODE : MT/PE/MM14

M. Sc. DEGREE EXAMINATION, NOVEMBER 2007
BIOINFORMATICS
FIRST SEMESTER

COURSE : ELECTIVES
PAPER : MATHEMATICAL METHODS
TIME : 3 HOURS

MAX. MARKS: 100

ANSWER ANY SIX QUESTIONS ONLY:

1. a) Out of 600 boys in a college, 168 play cricket, 180 play hockey, 252 play foot ball, 48 play both foot-ball and hockey, 60 play cricket and foot-ball, 30 play cricket and hockey, and 18 play all the three. How many do not play any game and how many play one game?
b) Define Equivalence relation and onto function.
c) Find the numbers in A.P whose sum is 24 and whose product is 440.

(7+4+6)

2. a) Find the sum to n terms of the series
.7 + .77 + .777 + ...

b) Sum the series (i) $\frac{2}{3!} + \frac{4}{5!} + \frac{6}{7!} + \dots\infty$

(ii) $\frac{1}{1.3} + \frac{1}{2.5} + \frac{1}{3.7} + \dots\infty$

(6+6+5)

3. a) If $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$ verify that $A^2 - 7A + I = 0$ where I stands for unit matrix and hence find A^{-1} .

- b) Using Matrices solve the equation

$$x + y + z = 6$$

$$x + 2y + 3z = 14$$

$$-x + y - z = -2$$

(7+10)

4. a) Differentiate the following with respect to x .

(i) $\log(\cos x)$ (ii) $(\sin x)^x$

- b) If $x = 2 \sin t$, $y = \cos 2t$ find $\frac{dy}{dx}$.

c) If $y = x^{x^{x^{x^{\dots\infty}}}}$ find $\frac{dy}{dx}$.

(6+6+5)

5. a) Show that the function $2x^3 + 3x^2 - 12x + 7$ is positive when $x > 1$.
 b) Find the maxima and minima of the function $x^5 - 5x^4 + 5x^3 + 10$.
 c) Find the equation of the tangent and normal to the curve $y = \frac{6x}{x^2 - 1}$ at the point (2,4).
 (5+6+6)
6. a) If $xy = ae^x + be^{-x}$ prove that $xy_2 + 2y_1 - xy = 0$.
 b) If $u = \frac{xy}{x+y}$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = u$.
 c) If $u = \tan^{-1} \frac{x^3 + y^3}{x - y}$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$.
 (6+5+6)
7. Integrate (i) $\frac{\sin(\log x)}{x}$
 (ii) $\frac{1}{x^2 + 2x + 5}$
 (iii) $\frac{1}{(x-1)(x-2)}$
 (5+6+6)
8. Solve the following equations:
 (i) $x\sqrt{1+y^2} + y\sqrt{1+x^2} \frac{dy}{dx} = 0$.
 (ii) $(e^x + 1)y dx + (y+1) dy = 0$.
 (iii) $(D^2 - 4D + 3)y = 0$
 (6+6+5)
9. a) Solve $(D^2 + 1)y = x \cos x$
 b) Express $f(x) = \frac{1}{2}(\pi - x)$ as a Fourier series in the interval 0 to 2π .
 (7+10)
10. a) Find the number of permutations of six objects taken three at a time.
 b) Find the number of permutations that can be formed from all the letters of the word Baseball.
 c) There are twelve points A,B,... in a given plane no three on the same line
 (i) How many triangles are determined by the points?
 (ii) How many triangles contains the point A as a vertex?
 d) Prove that $\binom{6}{0} + \binom{6}{1} + \binom{6}{2} + \dots + \binom{6}{6} = 2^6$
 (3+5+5+4)



