

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 86**  
**(For Candidates admitted during the academic year 2008 – 2009 & thereafter)**  
**SUBJECT CODE: EC/MC/MM14**

**B.A. DEGREE EXAMINATION NOVEMBER 2009**  
**BRANCH IV – ECONOMICS**  
**FIRST SEMESTER**

**COURSE : MAJOR – CORE**  
**PAPER : MATHEMATICAL METHODS**  
**TIME : 3 HOURS** **MAX.MARKS : 100**

**SECTION – A**

**ANSWER ALL QUESTIONS. EACH ANSWER NOT TO EXCEED 50 WORDS.**

**(10 X 3 = 30)**

1. Distinguish between abscissa and ordinate.
2. Find the length of the line joining the points (1,1) and (3,2)
3. Find the equation of straight line which passes through two points (2,2) and (4,8)
4. Given the Supply and Demand functions  $Q_s = -20 + 3P$ ,  $Q_d = 220 - 5P$ . Find the equilibrium price and quantity.
5. Name the conic sections by the types of curves, as the value of eccentricity is unity or not.
6. Write down the focus, directrix, vertex of the parabola  $y^2 = 4ax$
7. What is a continuous function?
8. Evaluate  $\lim_{x \rightarrow 7} \frac{x-7}{x^2-49}$
9. Find the successive derivatives of  $y = ax^4 + bx^3 + cx^2 + dx + e$
10. Derive the mathematical expression for the elasticity of demand.

**SECTION – B**

**ANSWER ANY FIVE QUESTIONS.**

**EACH ANSWER NOT TO EXCEED 300 WORDS.**

**(5 X 6 = 30)**

11. a) Show that the points (-1,1) (5,-3) (8,-5) lie on the same straight line.  
b) Find the equation of the line passing through the intersection of  $3x + 5y + 2 = 0$   
and  $y = x + 2$  with  $-3$  as its slope.

Find a) the equilibrium level of income and the equilibrium rate of interest  
b) the level of  $C, I, M_1$  and  $M_2$  when the economy *in* equilibrium.

12. Which of the following equations are functions and why? And also sketch the equations.

a)  $y = -2x + 7$

b)  $y = -x^2 + 6x + 15$

c)  $x = 4$

13. a) Define limit and write down the rules of limits

b) Evaluate  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$

14. Find the derivative of the following:

a)  $y = (4x^2 - 5x^7 + e^x)^3$

b)  $y = e^{\frac{5x+8}{x^2}}$

c)  $y = \left[ \frac{x^3 + 2x^2 + 5}{x^2 - 4} \right]$

15. Distinguish between (with graphs)

- Increasing and decreasing functions
- Concavity and convexity

16. For the following function

$$f(x) = x^3 - 18x^2 + 96x - 80$$

- Find the critical values
- Test the concavity to determine relative maxima and minima
- Check the inflexion points

17. From the following total cost function

$$TC = Q^3 - 5Q^2 + 60Q$$

Find 1) the average cost (AC) function

- the critical value at which AC is minimized
- the minimum average cost

### SECTION – B

**ANSWER ANY TWO QUESTIONS.**

**EACH ANSWER NOT TO EXCEED 1200 WORDS.**

**(2 X 20 =40)**

18. a) Derive the relationship between Average Cost and Marginal Cost curves.

b) Check Young's theorem for I)  $z = 7x^3 + 9xy + 2y^5$  ii)  $z = x^{0.3}y^{0.4}$

19. Express the degree of homogeneity of the following functions

a) i)  $z = 8x + 9y$

ii)  $z = x^2 + xy + y^2$

iii)  $z = x^{0.3}y^{0.4}$

iv)  $z = \frac{2x}{y}$

v)  $z = x^3 + 2xy + y^3$

b) A firm producing two goods  $x$  and  $y$  has the profit function:

$\pi = 64x - 2x^2 + 4xy - 4y^2 + 32y - 14$ . Find the profit maximizing level of output for each of the two goods and the profit.

20. A producer has the possibility of discriminating between the domestic and foreign markets for a product where the demands, respectively, are :  $Q_1 = 21 - 0.1P_1$

$Q_2 = 50 - 0.4P_2$  Total cost:  $TC = 2000 + 10Q$  where  $Q = Q_1 + Q_2$ .

What price will the producer charge in order to maximize profits a) with discrimination and b) without discrimination?

21. Prove that for a linearly homogeneous Cobb-Douglas production function  $Q = AL^\alpha K^\beta$

- i) It exhibits constant returns to scale.
- ii)  $MP_L = \alpha AP_L$
- iii)  $MP_K = \beta AP_K$
- iv) elasticity of substitution is unitary
- v) Euler's theorem

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