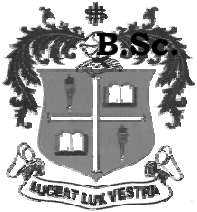


**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



**B.Sc. B.C.A. DEGREE EXAMINATION – STATS, PHY., CHE., COM.SCI. & APPLI.**

**THIRD SEMESTER – NOVEMBER 2013**

**MT 3206/3208 - APPLIED MATHEMATICS**

Date : 13/11/2013  
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**SECTION A**

**ANSWER ALL THE QUESTIONS.**

**(10 x 2 = 20)**

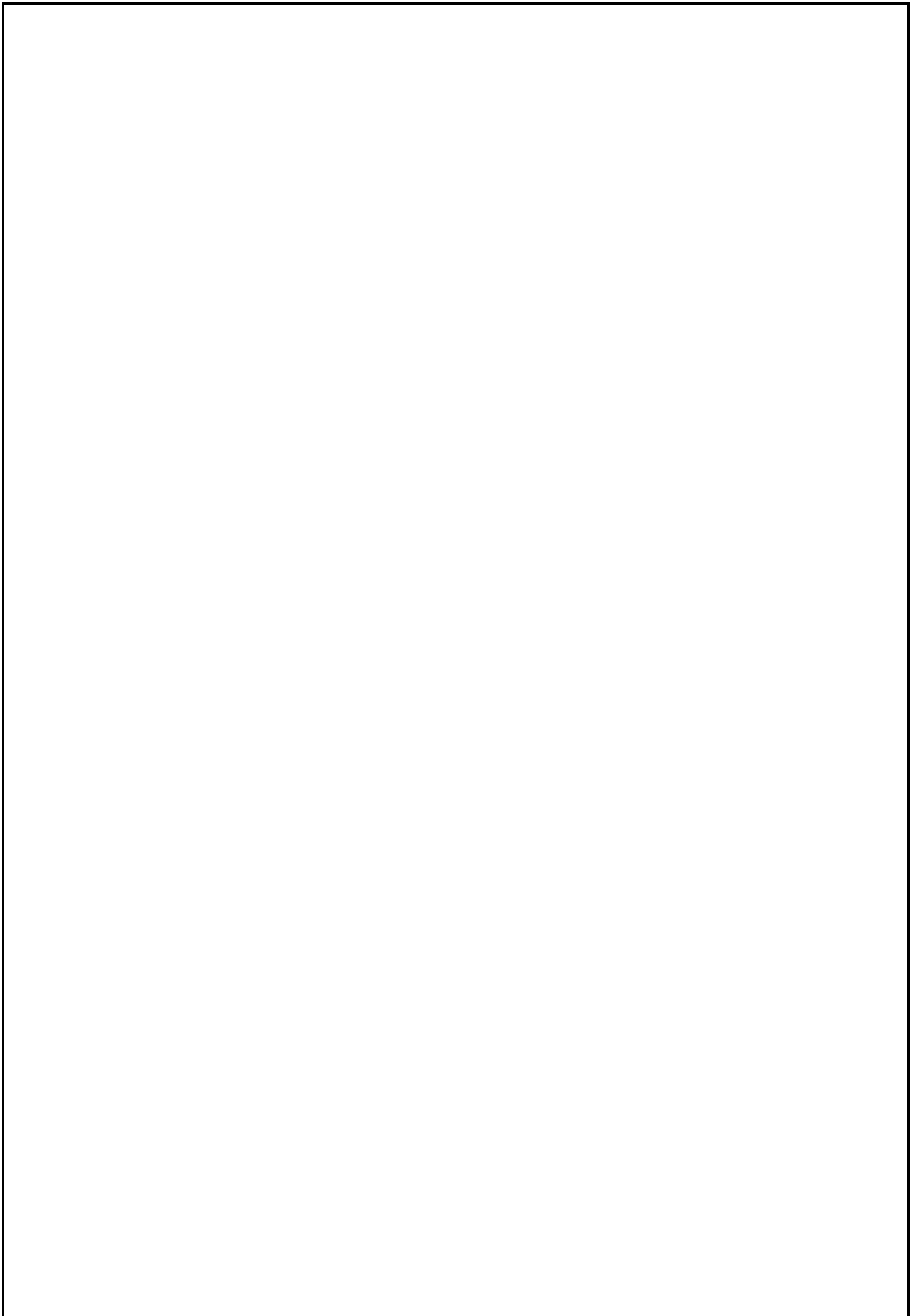
1. Evaluate  $\int \frac{x^2 - 4}{x^2} dx$ , if  $y = 1$  when  $x = 4$ .
2. If the marginal revenue function is  $R'(x) = 12 - 8x + x^2$ , determine the total revenue and demand function.
3. Find the divergence and curl of the vector point function  $\vec{F} = xy^2 \vec{i} + 2x^2 yz \vec{j} - 3yz^2 \vec{k}$ .
4. Find the velocity and acceleration of a particle which moves along the curve  $x = 2\sin 3t$ ;  $y = 2\cos 3t$ ;  $z = 8t$ .
5. Solve  $\frac{dy}{dx} + \left( \frac{1 - y^2}{1 - x^2} \right)^{\frac{1}{2}} = 0$ .
6. Determine the order and degree of  $t^2 \frac{d^2 s}{dt^2} - st \frac{ds}{dt} = s$ .
7. Define decision variable.
8. Define linear programming.
9. State trapezoidal rule to evaluate  $\int_{x_0}^{x_n} y(x) dx$ .
10. Using Simpsons rule to find  $\int_0^4 e^x dx$ . given that  $e^0 = 1; e^1 = 2.72; e^2 = 7.39; e^3 = 20.09; e^4 = 54.6$ .

**SECTION B**

**ANSWER ANY FIVE QUESTIONS.**

**(5 x 8 = 40)**

11. If the demand function is  $y = 39 - x^2$ , find the consumers surplus if  $x_0 = 5/2$  and the commodity is free, that is  $y_0 = 0$ .
12. The quantity demanded and price under pure competition are determined by the demand and supply function  $y = 36 - x^2$  and  $y = 6 + x^2/4$  respectively. Determine producer surplus.
13. Find the values of  $a, b, c$  so that the vector  $\vec{F} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + cy + 2z)\vec{k}$  is irrotational.
14. Evaluate  $\vec{F} = (xy)\vec{i} + (x^2 + y^2)\vec{j}$ , find  $\int \vec{F} \cdot d\vec{r}$ , where  $c$  is the area of the parabola  $y = x^2 - 4$  from  $A(2, 0)$  to  $B(4, 12)$  in the  $xy$  plane.
15. Solve  $\frac{dy}{dx} = \frac{x + 2y - 3}{2x + y - 3}$ .



16. Determine the maximum and minimum of a function  $f(x, y, z) = xy + 10x - x^2 - y^2 - z^2$ .
17. Using Newton's iterative method, find the root between 0 and 1 of  $x^3 = 6x - 4$  correct to two decimal places.
18. Evaluate  $\int_0^1 \frac{dx}{1+x^2}$ , using trapezoidal rule with  $h=0.2$ , Hence determine the value of  $\pi$ .

**SECTION C**

**ANSWER ANY TWO QUESTIONS.**

**(2 x 20 = 40)**

19. a) The quantity sold and the corresponding price, under monopoly are determined by the demand function  $y = 16 - x^2$  and the marginal cost function  $y' = 6 + x$  in such a way as to maximize the profit. Determine the corresponding consumer surplus.

b) Find the area bounded by the curve  $y=x^2$  and  $y=x$ . (10+10)

20. If  $\vec{F} = (2x^2 - 3z)\vec{i} + (2xy)\vec{j} + (4x)\vec{k}$ , then evaluate i)  $\iiint_V (\nabla \times \vec{F})dv$  and ii)  $\iiint_V (\nabla \cdot \vec{F})dv$

where V is the region bounded by  $x = 0, y = 0, z = 0$  and  $2x + 2y + z = 4$ .

21. a) A particle moves in a straight line with velocity given by  $\frac{ds}{dt} = s + 1$ , where s is the distance from the starting point measured in feet and the unit time taken by the particle to travel at distance of 33 yards.

b) Maximize  $Z=4x_1+10x_2, 2x_1+x_2 \leq 50; 2x_1+5x_2 \leq 100; 2x_1+3x_2 \leq 90; x_1, x_2 \geq 0$  using simplex method. (5+15)

22. a) Write down the Newton's Raphson formulae to find the square root of positive number K and hence find  $\sqrt{5}$ .

b) By dividing the range in to ten equal parts evaluate  $\int_0^\pi \sin x dx$  by using Simpson's 1/3 and Simpson's 3/8 rule. (10+10)

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