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 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

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 $\vec{F} = xy^2\,\vec{i} + 2x^2yz\vec{j} - 3yz^2\vec{k}$.
4. Find the velocity and acceleration of a particle which moves along the curve x=2Sin 3t; y= 2Cos3t; 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 $t^2\frac{d^2s}{dt^2} - st\frac{ds}{dt} = s.$
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 thee 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 $\int \vec{F}.d\vec{r}$, 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 π.

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) $\iiint_V (\nabla \bullet \vec{F}) dv$

    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 $Z=4x_1+10x_2$, $2x_1+x_2 \le 50$; $2x_1+5x_2 \le 100$; $2x_1+3x_2 \le 90$; $x_1, x_2 \ge 0$ 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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