LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – NOVEMBER 2015

MT 3206 - APPLIED MATHEMATICS

Date : 12/11/2015   Dept. No.   Max. : 100 Marks
Time : 09:00-12:00

PART - A

ANSWER ALL QUESTIONS   10 X 2 = 20

1) Define a revenue function.
2) Write any two properties of definite integrals.
3) Define divergence and curl of a vector function.
4) Show that $\vec{F} = z\hat{i} + x\hat{j} + y\hat{k}$ is solenoidal.
5) Write any two applications of differential equations.
6) Define mixture problem.
7) Find $L\left(e^{2t}\right)$.
8) If $L\left(f\left(t\right)\right) = F\left(s\right)$ then $L\left(e^{-at} f\left(t\right)\right) =$ _____
9) Find $L^{-1}\left(\dfrac{1}{s^2 + 4}\right)$.
10) Define Spearman's rank correlation coefficient.

PART - B

ANSWER ANY FIVE QUESTIONS   5 X 8= 40

11) The cost function of a firm is $C = 300x - 10x^2 + \dfrac{1}{3}x^3$ where C is the cost and x is the output.(i) Find output at which marginal cost is minimum.(ii) Find output at which average cost is equal to marginal cost.

12) Evaluate $\iint e^{\frac{y}{x}} dx dy$ over the region bounded by the straight lines $y = x$; $y = 0$ and $x = 1$.

13) Find the values of a, b, c so that the vector $\vec{F} = \left(x + 2y + az\right)\hat{i} + \left(bx - 3y - z\right)\hat{j} + \left(4x + cy + 2z\right)\hat{k}$ is irrotational.   .

14) If $\vec{F} = x^2\hat{i} + xy\hat{j}$ evaluate $\int \vec{F}.\vec{dr}$ along the line $y = x$ from $(0,0)$ to $(1,1)$.

15) Evaluate $\int\limits_{0}^{\infty} e^{-2t} \sin 3t\, dt$.

16) Find $L^{-1}\left(\dfrac{1}{s\left(s+1\right)\left(s+2\right)}\right)$.

17) A tank contains 100 gallon brine in which 10 lb of salt dissolved. Brine contains 2 lb salt per gallon flows into the tank at 5 gal/min. If the well-stirred mixture is drawn of at 4 gal/min. Find (i) the amount of salt in the tank at time t, and the amount of salt in the tank at t = 10 min.

18) From the following data calculate the coefficient of correlation.

X	1	2	3	4	5
Y	10	20	30	50	40

PART - C

ANSWER ANY TWO QUESTIONS   **20 X 2 = 40**

19) a) Determine consumer surplus and producer surplus under pure competition for the demand function

$p = 36 - x^2$ and supply function $p = 6 + \dfrac{x^2}{4}$ where p is the price and x is the quantity.

b) Evaluate $\displaystyle\int_{0}^{a}\int_{0}^{\sqrt{a^2-x^2}} y^3\,dy\,dx$.   **(12 + 8)**

20 a) If $\vec{F} = x^2 y\hat{i} + y^2 z\hat{j} + z^2 x\hat{k}$, find $curl\ curl\vec{F}$.

b) If $\vec{F} = (3x^2 + 6y)\hat{i} - 14yz\,\hat{j} + 20xz^2\hat{k}$, evaluate $\displaystyle\int \vec{F}.\overrightarrow{dr}$ along the line joining the points $(0,0,0)$ to $(1,1,1)$.   **(10 + 10)**

21a) Find $L^{-1}\left(\log\dfrac{s+1}{s-1} \right)$.

b)Solve $\dfrac{d^2 y}{dt^2} + 2\dfrac{dy}{dt} - 3y = \sin t$ given that $y = \dfrac{dy}{dt} = 0$ when $t = 0$.   **(8 + 12)**

22 a) In a culture of east, the amount A of active yeast grows at a rate proportional to the amount present. If the original amount A_0 doubles in 2 hours, how long does it for the original amount to triple?

b)From the following data calculate mean standard deviation, coefficient of variation and variance by assumed mean method.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No of students.	10	20	30	50	40	30

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