LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIRST SEMESTER – APRIL 2017

16UMT1AL02- MATHEMATICS FOR STATISTICS - I

Date: 02-05-2017   Dept. No.   Max. : 100 Marks
01:00-04:00

Part A

Answer ALL Questions: **(10 x 2 = 20)**

1. Define diagonal matrix with an example.

2. Express the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 2 & 4 & 3 \end{bmatrix}$ as a sum of symmetric and skew-symmetric matrix.

3. Write any two properties of determinants.

4. Define inverse of a matrix.

5. Write the differential coefficient of $\sin x$ and $\cos ax$.

6. Differentiate $x^2 - 3x + 2$ with respect to x.

7. For what values of x is $2x^3 - 15x^2 - 84x + 7$ a decreasing function?

8. Find the value of x for which the curve $y = 3x^2 - 2x^3$ is concave upwards.

9. Evaluate $\int x^2 \cos x^3 \, dx$.

10. Integrate: $\int \frac{dx}{x^2 + 2x + 5}$.

Part B

Answer any FIVE Questions: **(5 x 8 = 40)**

11. Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & -4 \\ -2 & 2 & 5 \\ 3 & -1 & 2 \end{pmatrix}$.

12. Find the Eigen values and Eigen vectors of $\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$.

13. (a) Find the differential coefficient of $(x + a)^m (x + b)^n$.

    (b) If $y = \left(\frac{1+x^2}{1-x^2} \right)^{1/2}$, find $\frac{dy}{dx}$.   (4 + 4)

14. Find the nth differential coefficient of $\cos^5 \theta \sin^7 \theta$.

15. Find the points of inflexion on the cubic $y = \frac{a^2 x}{x^2 + a^2}$ and show that they lie on a straight line.

16. Verify Euler's theorem when $u = x^3 - 3x^2 y + 3xy^2 + y^3$.

17. Evaluate $\int \frac{6x+5}{6+x-2x^2} \, dx$.

18. Integrate: $\int (3x - 2)\sqrt{x^2 + x + 1} \, dx$.

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Part C

Answer any TWO Questions: (2 x 20 = 40)

19. (a) Prove that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$.

(b) Examine consistency and hence solve $x+y+z = 3, x+2y+3z = 4, x+4y+9z = 6$.

(10 + 10)

20. (a) Verify Cayley Hamilton theorem $\begin{pmatrix} 1 & 2 & 3 \\ 0 & -1 & 2 \\ 1 & 0 & 2 \end{pmatrix}$.

(b) (i) If $x(1+y)^{1/2} + y(1+x)^{1/2} = 0$, prove that $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$.

(ii) Differentiate $\tan^{-1}\frac{2x}{1-x^2}$ with respect to $\sin^{-1}\frac{2x}{1+x^2}$.

(10 + 6 + 4)

21. (a) If $y = \sin(m\sin^{-1}x)$, prove that $(1-x^2)y_2 - xy_1 + m^2y = 0$ and $(1-x^2)y_{n+2} - (2n+$
1xyn+1+m2−n2yn=0.

(b) Find the maximum or minimum values of $2(x^2 - y^2) - x^4 + y^4$.

(10 + 10)

22. (a) Prove that $\int_0^{\frac{\pi}{2}} log(1 + tan\theta)d\theta = \frac{\pi}{8} log2$.

(b) Prove that $\int_0^{\frac{\pi}{2}} \frac{(sinx)^{\frac{3}{2}}}{(sinx)^{\frac{3}{2}}+(cosx)^{\frac{3}{2}}}dx = \frac{\pi}{4}$.

(10 + 10)

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