

Roll.No.

20UCSAT1001

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN  
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)  
Chromepet, Chennai - 600 044.

B.Sc Computer Science - END SEMESTER EXAMINATIONS - NOVEMBER 2025  
SEMESTER - I

**20UCSAT1001 - Allied Mathematics - I**

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

### Section B

Answer any **SIX** questions ( $6 \times 5 = 30$  Marks)

1. Find the coefficient of  $x^n$  in the expansion of  $\frac{2 + x + x^2}{(1 - x)^2}$

2. Find the coefficient of  $x^n$  in the expression of  $e^{e^x}$ .

3. Show that  $A = \begin{bmatrix} \frac{1}{3} & \frac{2}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{1}{3} & \frac{-2}{3} \\ \frac{-2}{3} & \frac{1}{3} & \frac{-1}{3} \end{bmatrix}$  is orthogonal.

4. Express  $\frac{\sin 6\theta}{\sin \theta}$  in terms of  $\cos \theta$

5. Express  $\cos 8\theta$  in terms of  $\sin \theta$

6. Evaluate  $L[t^2 e^{3t} \sinh t]$ .

7. Find the Laplace Transform of the following  
(i)  $\sin 3t \sin t$  (ii)  $e^{3t}(\cos^2 t - \sin^2 t)$

8. Find the inverse Laplace Transform of

(i)  $\frac{s^2}{(s - 4)^4}$  (ii)  $\frac{s - 3}{(s^2 - 6s + 13)}$

### Section C

Answer any **THREE** questions ( $3 \times 10 = 30$  Marks)

9. Find the sum to infinity of the series  $\frac{4}{18} + \frac{4.12}{18.27} + \frac{4.12.20}{18.27.36} + \dots$

10. Find the characteristic equation of the matrix  $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$  and hence obtain its inverse

11. Expand  $\sin^3 \theta \cos^5 \theta$  in a series of sines of multiples of  $\theta$

12. Find the Laplace Transform of

(i)  $\frac{e^{-3t} \sin 2t}{t}$

(ii)  $e^{-t} \int_0^t t \cos t dt$

13. Find the inverse Laplace Transform of

(i)  $\frac{1}{s(s+1)(s+9)}$  (ii)  $\frac{1}{(s^2+a^2)^2}$

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