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. END SEMESTER EXAMINATIONS NOVEMBER-2022
SEMESTER - III
20UPHCT3005 - Mathematical Physics & Statistical Mechanics

Total Duration : 2 Hrs 30 Mins. **Total Marks : 60**

Section A

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

1. Verify that A $= \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ is orthogonal.
2. Find the Rank of the Matrix A $= \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$ by reducing it to normal form.
3. Using Gamma function, Evaluate the following Integral I $= \int_0^\infty x^6 e^{-2x}$ dx.
4. Obtain the Relationship between Beta and Gamma Function.
5. Deduce the Recurrence relation $XJ_n'(x) = nJ_n(x) - XJ_{n+1}(x)$.
6. Deduce the general solution for Legendre's differential equation.
7. Compare Micro and Macro States in Quantum Systems.
8. Narrate the points by comparing three different Statistics.

Section B

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

9. Find the inverse matrix of the matrix A $= \begin{bmatrix} 1 & 1 & 2 \\ 9 & 2 & 0 \\ 5 & 0 & 3 \end{bmatrix}$ using the Cayley–Hamilton theorem.
10. Show that $\int_0^{\pi/2} sin^p\theta cos^q\theta d\theta = \frac{\lceil(\frac{p+1}{2})\lceil(\frac{q+1}{2})}{2\lceil(\frac{p+q+2}{2})}$
11. Using Rodrigue's formula arrive at first three orders of Legenders Polynomials.
12. Explain Maxwell Boltzmann Distribution law for microstates in a classical.
13. Explain the Derivation of Bose – Einstein Distributive Law.

*****

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. END SEMESTER EXAMINATIONS NOVEMBER-2022
SEMESTER - III
20UPHCT3005 - Mathematical Physics & Statistical Mechanics

Total Duration : 2 Hrs 30 Mins. **Total Marks : 60**

Section A

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

1. Verify that A $= \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ is orthogonal.
2. Find the Rank of the Matrix A $= \begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$ by reducing it to normal form.
3. Using Gamma function, Evaluate the following Integral I $= \int_0^\infty x^6 e^{-2x}$ dx.
4. Obtain the Relationship between Beta and Gamma Function.
5. Deduce the Recurrence relation $XJ_n'(x) = nJ_n(x) - XJ_{n+1}(x)$.
6. Deduce the general solution for Legendre's differential equation.
7. Compare Micro and Macro States in Quantum Systems.
8. Narrate the points by comparing three different Statistics.

Section B

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

9. Find the inverse matrix of the matrix A $= \begin{bmatrix} 1 & 1 & 2 \\ 9 & 2 & 0 \\ 5 & 0 & 3 \end{bmatrix}$ using the Cayley–Hamilton theorem.
10. Show that $\int_0^{\pi/2} sin^p\theta cos^q\theta d\theta = \frac{\lceil(\frac{p+1}{2})\lceil(\frac{q+1}{2})}{2\lceil(\frac{p+q+2}{2})}$
11. Using Rodrigue's formula arrive at first three orders of Legenders Polynomials.
12. Explain Maxwell Boltzmann Distribution law for microstates in a classical.
13. Explain the Derivation of Bose – Einstein Distributive Law.

*****