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.(Physics) END SEMESTER EXAMINATIONS NOVEMBER -2023
SEMESTER - III

22UPHCT3005 - Mathematical Physics and Statistical Mechanics

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

Section B

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

1. Find the eigen values of the matrix, A $= \begin{pmatrix} 6 & -6 & 5 \\ 14 & -13 & 10 \\ 7 & -6 & 4 \end{pmatrix}$
2. Checks whether the matrix $\begin{pmatrix} 1/\sqrt{2} & i/\sqrt{2} \\ -i/\sqrt{2} & -1/\sqrt{2} \end{pmatrix}$ is unitary.
3. Arrive at the relation between beta and gamma functions.
4. Evaluate $\int_0^\infty \frac{x^8(1-x^6)}{(1+x)^{24}}dx$
5. Evaluate $J_{\frac{1}{2}}(x)$
6. Write brief notes on microstates and macrostates with suitable examples.
7. State the postulates of classical statistics.
8. Compare B-E, F-D and M-B statistics.

Section C

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

9. Verify Cayley - Hamilton theorem and hence find the inverse for $\begin{pmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$
10. Evaluate:
    (i) $\int_0^1 \frac{dx}{\sqrt{1-x^n}}$
    (ii) $\int_0^1 \frac{dx}{(1-x^n)^{1/n}}$
11. Arrive at the equation for Laguerre polynomial from the Laguerre's differential equation.
12. Arrive at an equation for Maxwell - Boltzmann distribution law.
13. Derive the equation of Bose - Einstein distribution 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.(Physics) END SEMESTER EXAMINATIONS NOVEMBER -2023
SEMESTER - III

22UPHCT3005 - Mathematical Physics and Statistical Mechanics

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

Section B

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

1. Find the eigen values of the matrix, A $= \begin{pmatrix} 6 & -6 & 5 \\ 14 & -13 & 10 \\ 7 & -6 & 4 \end{pmatrix}$
2. Checks whether the matrix $\begin{pmatrix} 1/\sqrt{2} & i/\sqrt{2} \\ -i/\sqrt{2} & -1/\sqrt{2} \end{pmatrix}$ is unitary.
3. Arrive at the relation between beta and gamma functions.
4. Evaluate $\int_0^\infty \frac{x^8(1-x^6)}{(1+x)^{24}} dx$
5. Evaluate $J_{\frac{1}{2}}(x)$
6. Write brief notes on microstates and macrostates with suitable examples.
7. State the postulates of classical statistics.
8. Compare B-E, F-D and M-B statistics.

Section C

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

9. Verify Cayley - Hamilton theorem and hence find the inverse for $\begin{pmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$
10. Evaluate:
    (i) $\int_0^1 \frac{dx}{\sqrt{1-x^n}}$
    (ii) $\int_0^1 \frac{dx}{(1-x^n)^{1/n}}$
11. Arrive at the equation for Laguerre polynomial from the Laguerre's differential equation.
12. Arrive at an equation for Maxwell - Boltzmann distribution law.
13. Derive the equation of Bose - Einstein distribution law.

*****