

# Gurudas College

Internal Assessment Examination, 2021-22

Subject-CEMA, SEM-V

Paper- CC-5-11

Time: 30 Minutes

Full Marks: 10

Answer 10 marks, from the following

1. What is probability of any event occurring? (1)
2. Define partition function. (1)
3. Derive the expression of internal energy in terms of partition function. (2)
4. Calculate the number of ways of distributing 20 identical objects with the arrangement 1, 0, 3, 5, 10, 1. (2)
5. Write down the Boltzmann distribution equation in terms of partition function. Clearly mention the terms involved in it. (1)
6. Write down the consequences of zero-point energy of linear harmonic oscillator. (2)
7. Prove that  $[L^2, L_x] = 0$ . (2)
8. Give two examples where Newton – Raphson method fails. (2)
9. Show that central difference method for numerical differentiation is more accurate than forward or backward method. (2)
10. Calculate  $\langle x^2 \rangle$  for harmonic oscillator in ground state,

$$\left[ \psi = \left(\frac{\alpha}{\pi}\right)^{1/4} \exp(-\alpha x^2/2), \text{ and } \int_0^\infty x^2 \exp(-ax^2) dx = \frac{\sqrt{\pi}}{4a^{3/2}} \right] \quad (2)$$