B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2014

Sixth Semester

Core Course—RELATIVITY AND SPECTROSCOPY

(Common for Model–I B.Sc. Physics, Model–II B.Sc. Physics,
B.Sc. Physics – EEM and B.Sc. Physics – Instrumentation)

Time : Three Hours   Maximum Weight : 25

Part A

Answer all questions.
Objective type questions.
Weight 1 for each bunch.

Bunch I

1. ————— frames are called inertial frames.

2. The laws of physics are ————— in all inertial frames of reference.

3. The increase of mass with velocity can be tested in ————— accelerators.

4. The splitting of spectral lines under the influence of electric field is called —————.

Bunch II

5. In Bohr atom model 'n' denotes ————— quantum number.

6. The atom model based on quantized vectors is called —————.

7. Same multiplicity of electronic state is associated with ————— phenomenon.

8. The more intense lines in Raman Spectra are ————— lines.

Bunch III

9. The electronic spectra are in ————— region of the electronic spectrum.

10. ————— electron is responsible for ESR spectroscopy.

11. Acceleration is ————— invariant under Galilean transformation.

12. In Stren-Gerlach experiment the magnetic dipole is placed in a ————— magnetic field.

Bunch IV

13. According to mass-energy relation mass may occur as —————.

14. The Raman lines are ————— displaced about their mean position.

15. Sodium D-lines are due to transition from a P state to the ————— state.

16. The molecular spectra arise due to the transitions between allowed energy states of —————.

$$(4 \times 1 = 4)$$

Part B (Short Answer questions)

Answer any five questions.
Weight 1 each.

17. Distinguish inertial and non-inertial frames.

18. Give the postulates of special theory of relativity.

19. What are the components of electromagnetic spectrum ?

20. State the exclusion principle.

21. What is Paschen Back effect ?

22. Explain L-S coupling.

23. What is called phosphoresence ?

24. Define NMR.

$$(5 \times 1 = 5)$$

Part C (Short Essay/Problems)

Answer any four questions.
Weight 2 each.

25. How fast would a rocket have to go relative to an observer for its length to be contracted to 99% of its length at rest ?

26. Calculate the rest energy of an electron in Joules and in electron Volts.

27. Write a note on fine structure of Sodium D-line.

28. A sample of a material is placed in a magnetic field of flux density 0.3 Weber/ m^2. How far apart are the Zeeman components of a spectral line of wavelength 4000 Amstrong unit.

29. The lines in the pure rotational spectrum of HCl are spaced as 20.8×10^2 per meter. Calculate the moment of inertia and the intermolecular distance. Mass of proton = 1.67×10^{-27} kg and mass of chlorine is 58.5×10^{-27} kg.

30. Given that the spacing between the vibrational levels of CO molecule is 8.45×10^{-2} eV. The reduced mass of CO molecule is 1.14×10^{-26} kg. Find the force constant of the molecule.

$$(4 \times 2 = 8)$$

Part D (Essay)

Answer any **two** *questions.*
Weight 4 each.

31. Describe about Lorentz transformation in relativity also explain the concept of time dilation.

32. With neat diagram explain Stern-Gerlach experiment and give its significance.

33. What is Raman effect ? Describe the classical and quantum theory of Raman effect.

$(2 \times 4 = 8)$