Reg. No…….. Name…… **18U637**

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2018

SEMESTER **– 6: PHYSICS (CORE COURSE)**

COURSE: **15U6CRPHY12 –: RELATIVITY AND SPECTROSCOPY**

Common for Regular (2015 Admission) & Supplementary (2014 Admission)

Time: Three Hours Max. Marks: 60

PART A

Answer ***all*** questions. Each question carries ***1*** mark.

1. What is meant by fine structure of spectral lines?
2. What is rotational quantum number?
3. The twin paradox is an example for ……..
4. ESR Spectra lies in …… region of electromagnetic spectrum.
5. What is called fluorescence?
6. What is the significance of Stern-Gerlach experiment?
7. Explain length contraction.
8. State Pauli's exclusion principle.
9. What are the different molecular energies?
10. ……. is invariant under Galilean transformation. (1 x 10 = 10)

PART B

Answer ***any seven*** questions. Each question carries ***2*** marks.

11. Explain Russel-Sanders coupling.
12. What are the shortcomings of Bohr's theory of atom?
13. Discuss the experimental evidence in support of electron spin.
14. What are the postulates of special theory of relativity?
15. Outline the theory of NMR spectroscopy.
16. What is an absorption spectrum? Give an example.
17. What are the important features of vector atom model?
18. What is Paschen Back effect?
19. State the intensity rules for the spectral lines. (2 x 7 = 14)

PART C

Answer ***any four*** questions. Each question carries ***4*** marks.

20. Derive an expression for the radius of n^{th} orbit of hydrogen atom.
21. Explain the fine structure of sodium D_1 and D_2 lines.
22. An electron in a circular orbit has an angular momentum $\sqrt{2}\hbar$ in a field of 0.5 T. What is its Larmor frequency?

23. The moment of inertia of the CO molecule is $1.46 \times 10^{-46} kgm^2$. Calculate the energy in eV and the angular velocity in the lowest rotational energy level of the CO molecule.
24. What are the wavelengths of the first three lines of the Paschen series. Given the value of Rydberg constant is $1.097 \times 10^7 m^{-1}$.
25. A sample of certain element is placed in a magnetic field of flux density 0.3 T. How far apart are the Zeeman components of wavelength $4500A^0$. (4 x 4 = 16)

PART D

Answer ***any two*** questions. Each question carries ***10*** marks

26. Describe the vector atom model and its salient features. Briefly discuss the quantum numbers associated with the model.
27. Sketch the experimental set up for Raman Effect. Discuss the classical theory of Raman effect and also mention its failure.
28. Explain the spectrum of a vibrating diatomic molecule. Describe infra-red spectrometer in detail.
29. What is anomalous Zeeman Effect? Outline the quantum theory of anomalous Zeeman effect.

(10 x 2 = 20)

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