E 1557

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Reg. No...............................

Name................................

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2016

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)

[2013 Admissions]

Time : Three Hours

Maximum : 60 Marks

Part A

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

1. A frame in which Newton's laws holds good is an ————— frame.

2. If the two frames are inertial, then the transformation equations are called ————— transformation equations.

3. All ————— and rotating frames are non-inertial.

4. Solar spectrum is an absorption ————— spectrum.

5. The orbital angular momentum is given by ————— in vector atom model.

6. In heavy atoms ————— coupling is observed.

7. The ————— rotational spectra are in the microwave and infrared regions.

8. Pure ————— spectra are observed in liquids.

$(8 \times 1 = 8)$

Part B

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

9. Differentiate between Inertial and Non-inertial frames.

10. State the postulates of STR.

11. Explain length contraction.

12. What is twin paradox ?

13. Give the conclusions of Stern-Gerlach experiment.

14. What is LS coupling ?

15. State the theory of ESR.

16. What is Raman effect ?

Turn over

17. Explain Fluorescence.

18. What is rotational quantum number ?

$(6 \times 2 = 12)$

Part C

Answer any four questions.
Each question carries 4 marks.

19. Arrive at the relativistic laws of addition of velocities.

20. A metro of eight compartments each of length 7 m. speeds at 30 m/s. Determine its contraction.

21. In the M-M experiment the effective length of each path is 12 m. and the light has 600 nm wavelength. Find the expected fringe shift.

22. In the spectrum of HCl molecule the first line falls at 20.68^{-1}. Calculate the moment of inertia, reduced mass and the bond length of the molecule.

23. Bring out the fine structure of sodium D-lines.

24. Describe IR spectrometer arrangement due to Wadsworth.

$(4 \times 4 = 16)$

Part D

*Answer any **two** questions.*
Each question carries 12 marks.

25. Obtain the mass energy relation.

26. Describe vector atom model with salient features.

27. Discuss the theory of normal Zeeman effect with experimental setup.

28. Discuss vibration rotation spectrum of a diatomic molecule taking it as a harmonic oscillator.

$(2 \times 12 = 24)$