Q.P. Code – 50821

Third Year B.Sc. Degree Examination

SEPTEMBER/OCTOBER 2013

(Directorate of Distance Education)

Physics

(DSC 210) Paper III – SPECTROSCOPY, WAVE MECHANICS, STATISTICAL MECHANICS, RELATIVITY AND ASTROPHYSICS

Time : 3 Hours] *[Max. Marks : 75/85*

Instructions to Candidates :

1) *Students who have attended **25** marks **I-A** scheme will have to answer for total of **75** marks.*

2) *Students who have attended **15** marks **I-A** scheme will have to answer for total of **85** marks.*

3) *Section-**E** is **compulsory** for **85** marks scheme **only**.*

SECTION – A

I. Answer **ALL** questions : **10 × 1 = 10**

1. With regard to Millikan's experiment for measuring electronic charge *e*, does the apparatus have to evacuated?

2. What is Bohr Magneton?

3. Mention any one significance of Pauli's exclusion principle.

4. X-rays cannot be used in microscopes, why?

5. An electron, proton and an α-particle have the same deBroglie wavelength which are moves faster?

6. What is normalised wave function?

7. What is Minkowski world?

8. What is the principle of equivalence?

9. State Hubble's law.

10. What is degeneracy?

SECTION – B

II. Answer any **FIVE** questions : **5 × 3 = 15**

11. What is stark effect? Explain stark effect briefly.

12. Write any three applications of NMR.

13. Explain why electron cannot present inside the nucleus.

14. Distinguish between M-B, F-D and B-E statistics.

15. Obtain the relativistic energy-momentum relation.

16. Distinguish between Raman effect and Compton effect.

17. Explain Big-Bang cosmology.

SECTION – C

III. Answer any **FIVE** questions : **5 × 6 = 30**

18. Describe Thomson's method of determining e/m of electron with theory.

19. Give the quantum theory of Anomalous Zeeman effect.

20. Derive Schrodinger's time-Independent wave equation.

21. Derive Planck's law from B-E statistics.

22. Write a note on Neutron stars and Black holes.

23. Derive Mass-energy relation.

24. State Duane-Hunt rule. State and derive Bragg's law.

SECTION – D

IV. Answer any **TWO** questions : **2 × 10 = 20**

25. (a) Explain space quantization and spin of electron.

(b) Calculate the Zeeman shift produced in the normal Zeeman effect when a spectral line of wave length 590 nm is subjected to a magnetic field of 5000 Gauss. Given e/m of electron to be 1.76×10^{11} c kg^{-1}. **6 + 4**

26. (a) Explain Raman effect with neat diagram and give the quantum theory of Raman effect.

(b) At which angle of scattering the Compton shift $\Delta\lambda$ will have the maximum value? Calculate the Compton wavelength in A° for an electron. **6 + 4**

27. (a) With a neat diagram explain the construction and working of Ruby laser with energy level diagram.

(b) Estimate the order of magnitude of the standing waves in a laser when the length of the resonating cavity is 1 m and the wavelength is (i) 3.3×10^{-6} m and (ii) 6.328×10^{-7} m. **6 + 4**

28. (a) Set up Schrondinger wave equation for a particle in one dimentional potential box and solve it to obtain expression for energy eigenvalues and eigen functions.

(b) An eigen value of an electron confined to a one dimentional box of length 0.2 nm is 151 eV. What is the order of excited state? **6 + 4**

SECTION – E

V. Answer any **ONE** of the following questions : **1 × 10 = 10**

(**Compulsory** question for **85** marks scheme **only**)

29. (a) Explain length contraction and time dilation.

(b) A clock keeps correct time, with what speed should it be moved related to an observer so that it may seem to lose one minute in one day. **6 + 4**

30. (a) Explain H.R. diagram and Chandrashekar limit.

(b) If the apparent and absolute magnitude of the star Aldebaran are + 0.87 and – 0.63 respectively. Calculate its distance from the Earth.
