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PG4S-036-B-23

M.Sc. IV Semester (CBCS) Degree Examination

PHYSICS

Energy Physics-II

Paper : SCT 4.2

Time : 3 Hours **Maximum Marks :80**

Instructions to Candidates:

Answer all questions of 15 marks each and any two questions of 10 marks.

1. a) Derive the four factor formula and apply the finite size correction to the multiplication factor.

   b) Discuss the slowing down theory of neutrons. What are the different parameters to be considered to choose a good moderating material? (7+8)

(OR)

2. Prove that the mean fractional energy loss is the same for all collisions. Also, discuss the logarithmic decrement in energy of neutrons. (15)

3. a) Explain briefly the critical size of the reactor. Arrive at the critical size of a bare homogeneous reactor in case of rectangular shape.

   b) Write a note fast breeder reactor. (10+5)

(OR)

4. Give an account of nuclear power reactor with a special reference to gas cooled and graphite moderated reactor. (15)

5. What are thermonuclear reactions? Discuss the Lawson's conditions for fusion reactor. (15)

(OR)

6 a) Discuss in detail D-D and D-T reactions.

   b) Derive the MHD equations and discuss the stability of plasma. (7+8)

7. a) Discuss the construction and working of vertical axis wind mill.

   b) Give the mechanism of photosynthesis. (10+5)

(OR)

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   b) Give the mechanism of photosynthesis. **(10+5)**

(OR)

8. a) What is geothermal energy? Explain the sources geothermal energy.

b) Discuss the field estimation of wind energy. Also mention the criteria for site selection. **(6+9)**

9. Discuss the classification of neutrons. **(10)**

10. Discuss the construction and working of a fast breeder reactor. **(10)**

11. Write a note on Tokomak. **(10)**

12. Write a note on enzymatic conversion of biomass and liquid fuel production. **(10)**

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PG4S-032-B-23

M.Sc IV Semester (CBCS) Degree Examination

PHYSICS

Quantum Mechanics - II

Paper - HCT 4.2

Time : 3 Hours **Maximum Marks :80**

Instructions: Answer all questions of 15 marks each and Two questions of 10 marks each.

1. a) Explain the Hamiltonian of charged particle in an electromagnetic field and use it to the transition rate in dipole approximation.

   b) What is sudden approximation? Explain **(10+5)**

(OR)

2. a) Derive the expressions for Einstein A and B coefficients.

   b) Explain the applications of first order perturbation theory. **(8+7)**

3. a) Illustrate how the principle of indistinguishability influences the quantum mechanics of a system of particles.

   b) What is Pauli Exclusion Principle? Explain. **(10+5)**

(OR)

4. a) Find the eigen values and eigen functions of the total angular momentum consisting of the orbital angular momentum and spin angular momentum.

   b) What are Clebsch-Gordan coefficients? Explain. **(10+5)**

5. a) Explain the concept of space inversion-parity and time reversal invariance.

   b) Explain the Symmetry and degeneracy **(10+5)**

(OR)

6. a) Discuss the free particle solutions of the Dirac equation.

   b) Obtain the Dirac equation for an electron in a central force field **(8+7)**

7. a) Discuss the Quantization of non-relativistic Schrodinger wave equation.

   b) What are classical and quantum field equations? Explain. **(10+5)**

(OR)

8. a) Outline the general procedure for the quantization of fields.

   b) Show that the classical Hamiltonian equations of motion for a field agree with the Lagrangian equation. (8+7)

9. Explain wide and closely spaced levels in perturbation theory. (10)

10. Discuss singlet and triplet states of He atom. (10)

11. Show that spin-orbit interaction is a consequence of the Dirac relativistic equation. (10)

12. Obtain classical Lagrangian and Hamiltonian equations for wave fields. (10)
