FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2019
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT

Roll Number

PHYSICS, PAPER-II

TIME ALLOWED: THREE HOURS	**PART-I (MCQS) MAXIMUM MARKS = 20**
PART-I(MCQS): MAXIMUM 30 MINUTES	**PART-II MAXIMUM MARKS = 80**

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II**. **ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the question will not be considered.
(vii) **Use of Calculator is allowed.**

PART – II

Q. 2. **(a)** Derive an expression for the torque and potential energy of an electric dipole in an electric field. (10)
(b) Show that the energy density of a parallel plate capacitor with dielectric medium between them is directly proportional to the square of electric field intensity. (6)
(c) In a microwave oven torque acting on an electric dipole is responsible for the production of heat. Comment. (4) **(20)**

Q. 3. **(a)** Discuss origin of magnetism by considering processes that creates magnetic field in an atom. (8)
(b) What are ferromagnetic domains? How does a typical ferromagnetic material is investigated by Hysteresis loop for technological applications? (8)
(c) How does effect of nuclear magnetism becomes important in nuclear magnetic resonance? (4) **(20)**

Q. 4. **(a)** Derive an expression for the time-independent Schrodinger wave equation in one dimension for a single particle. Define Hamiltonian operator. (10)
(b) Discuss various quantum numbers to describe the complete behavior of an electron in an orbital. (6)
(c) How slowly must an electron be moving for its deBroglie wave-length equal to 1mm? (4) **(20)**

Q. 5. **(a)** Discuss the behavior of particle trapped in infinitely deep well and show that the energy of particle inside the well is quantized. (10)
(b) Explain the terms wave function, probability density and normalization condition associated with quantum mechanics. (6)
(c) Find the expectation value of the momentum. (4) **(20)**

Q. 6. **(a)** What is an oscillator? How an LC oscillator works? Discuss Barkhaausian criteria for oscillations. (10)
(b) What is a feedback transistor? Differentiate negative feedback and positive feedback. (6)
(c) what are RC filters (4) **(20)**

Q. 7. **(a)** Discuss principle, construction and working of Nuclear Reactor. Define Breeder Reactor. (8)
(b) What is nuclear fusion? Describe Proton-Proton cycles for energy release in the Sun and Stars. (8)
(c) What is Q-Value of a nuclear reaction? (4) **(20)**

Q. 8. Write comprehensive notes on any TWO of the following **(10 each)** **(20)**
(a) The Biot and Savart law **(b)** Cyclotron
(c) Electromagnetic waves

****