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FEDERAL PUBLIC SERVICE COMMISSIO

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2012

Roll

PHYSICS, PAPER-II

TIME ALLOWED:	**(PART-I MCQs)**	**30 MINUTES**	**MAXIMUM MARKS: 20**
THREE HOURS	**(PART-II)**	**2 HOURS & 30 MINUTES**	**MAXIMUM MARKS: 80**

NOTE: **(i)** Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper.**
(ii) Attempt **ONLY FOUR** questions. **ALL** questions carry **EQUAL** marks.
(iii) Extra attempt of any question or any part of the attempted question will not be considered.
(iv) **Use of Scientific Calculator is allowed.**

PART-II

Q. 2. **(a)** Charge is uniformly distributed on a line with charge density λ. Calculate the electric field intensity at a point lying vertically at a distance y from the center of charge distribution. **(10)**

(b) In a uniform electric field near the surface of earth, a particle having charge of $q = -3x10^{-9}$ C is acted upon by a force $5x10^{-6}$ N. Find
(i) The magnitude of electric field.
(ii) Find the magnitude and direction of electric force on an electron placed in this field.
(iii) Find the ratio of electric force and gravitational force in this case. **(3,3,3)**

(c) What is meant by point charge? **(1)**

Q. 3. **(a)** State the Faraday's law of electromagnetic induction. Using this law, find the inductance due to a current carrying coil in the specific case of solenoid. **(10)**

(b) A solenoid 126cm long is formed from 1870 windings carrying a current of 4.36A. The core of the solenoid is filled with iron and the effective permeability constant is 968. Calculate the inductance of the solenoid assuming that it can be treated as ideal with a diameter of 4.45cm. **(8)**

(c) Write the importance of Faraday's law in today's prospective. **(2)**

Q. 4. **(a)** What is Modern Physics? Give the failure of Classical Physics in explanation of Photoelectric effect. Derive the photoelectric equation and comment how quantum physics was successful in explanation of photoelectric effect. Also plot photoelectric equation. **(3,3,5,3)**

(b) A beam of radiation with frequency $3.19x10^{15}$ hertz is incident on a metal surface and knocks out electrons from it. If the work function of the metal is 2.33 eV, find the maximum kinetic energy of the emitted electrons in electron volts. **(5)**

(c) What is the difference between ionization energy and work function? **(1)**

Q. 5. **(a)** Differentiate the Metals, Semiconductors and Insulators on the basis of Energy Band Theory. **(5)**

(b) What is a PN junction? How it is formed and why it is called a diode. **(8)**

(c) What is a rectifier? How we can use diode as a rectifier? Explain full-wave and half-wave rectification in detail. **(7)**

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Q. 6. **(a)** Explain how Devison and Germer experimentally proved that a material particle like accelerated electrons can act as a wave.

(b) Calculate the de.Broglie wavelength of an electron which is accelerated through a potential difference of 100 KV. Should we apply the relativistic correction in this calculation? **(8)**

(c) Sketch the probability of occurrence of an electron in Hydrogen atom. **(2)**

Q. 7. **(a)** What is Radioactivity? What changes occur in radioactive nucleus when α, β and γ radiation are emitted from it. How we can differentiate these rays experimentally. **(10)**

(b) Define half-life of a radio element. Describe the law of radioactive decay and plot a graph between half life and activity of a radio-nuclide. **(8)**

(c) Is proton an elementary particle; comment. **(2)**

Q. 8. **(a)** Define nuclear Fission and Fusion Reactions. What is the source of energy released in these reactions; Justify your answer with examples. Explain Fission Chain Reaction. **(10)**

(b) A $^{7}Li_{3}$ is bombarded by a proton. Two alpha particles ($^{4}He_{2}$) are produced. Find the reaction energy.
Mass of proton = 1.007825amu Mass of $^{7}Li_{3}$ = 7.016003amu
Mass of alpha particle = 4.002603amu **(8)**

(c) In the given nuclear reaction $_{13}Al^{27} + _{1}H^{1} \longrightarrow _{z}X^{A} + _{2}He^{4}$; What is X? **(2)**

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