FEDERAL PUBLIC SERVICE COMMISSI

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2011

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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)** **First** attempt **PART-I (MCQs)** on separate Answer Sheet which shall be taken back after 30 minutes.
(ii) **Use of scientific calculator is allowed.**
(iii) **Overwriting/cutting of the options/answers will not be given credit.**

(PART-I MCQs) (COMPULSORY)

Q.1. Select the best option/answer and fill in the **appropriate box** on the **Answer Sheet**. **(1 x 20=20)**

(i) The Lorentz force is the sum of:
(a) Gravitational and centripetal force (b) Electric and magnetic force
(c) Magnetic and nuclear force (d) Electric and nuclear force

(ii) The area under the hysteresis loop is proportional to:
(a) Magnetic energy density (b) Thermal energy per unit volume
(c) Electrical energy per unit volume (d) Mechenical energy per unit volume

(iii) The frequency of A.C is measured using:
(a) Multimeter (b) Avometer (c) Tachometer (d) Speedometer

(iv) $\Delta.E=\rho/\epsilon_0$ is called:
(a) Gauss's law (b) Faraday's law (c) Ampere 's law (d) Boit and savart law

(v) For computation of the rate at which the dipole radiates energy, the interaction of the normal component of _____ is done over sphere of radius R.
(a) Electric field (b) Pointing vector (c) Addition vector (d) Radiation

(vi) Semiconductor material have _____ bonds:
(a) Ionic (b) Covalent (c) Mutual (d) Metallic

(vii) The depletion region of a p-n junction is formed:
(a) During the manufacturing process (b) When forward bias is applied to it
(c) Under reverse bias (d) When its temperature is reduced

(viii) The current amplification factor alpha dc is given by:
(a) I_C/I_E (b) I_C/I_B (c) I_B/I_E (d) I_B/I_C

(ix) In amplitude modulation:
(a) Carrier frequency is changed (b) Carrier amplitude is changed
(c) Three sidebands are produced (d) Fidelity is improved

(x) Demodulation:
(a) is performed at the transmitting station (b) removes side bands
(c) rectifies modulation signal (d) is opposite of modulation

(xi) Which of the following X-rays lines will have the greatest frequency in a given element?
(a) K_α (b) K_β (c) L_α (d) It depends on the element

(xii) Which of these statements is a consequence of plank's derivation of the radiation law?
(a) Atomic oscillator can emit and absorb energy at discrete values only
(b) Atomic oscillator can emit and absorb energy at discrete frequencies only
(c) Both (a) and (b) (d) Neither (a) nor (b)

(xiii) The Zeeman effect without the spin of the electron is called ____ Zeeman effect.
(a) Anomalous (b) Normal (c) Paschen (d) None of these

(xiv) Zero point energy of harmonic oscillator is:
(a) $\hbar w$ (b) $\hbar w/2$ (c) Zero (d) $\hbar w^2$

(xv) According to Pauli Exclusion principle for two identical fermions, the total ____ is antisy

(a) Matrix (b) Wave function (c) Operator (d) Te

(xvi) The decay rate of a radioactive source is measured in units of:

(a) Curies (b) Roentgens (c) Rads (d) Rems

(xvii) Why are the fission fragments usually radioactive?

(a) They come originally from radioactive ^{235}U (b) They have a large neutron excess

(c) They have a large binding energy per nucleon (d) They are moving at high speed

(xviii) In a nuclear reactor, the function of the moderator is:

(a) to absorb neutrons (b) to keep the reactor from going critical

(c) to slow down the neutrons (d) to absorb heat from the core

(xix) What is the main difficulty associated with the fusion process as a source of electrical power?

(a) The scarcity of fuel (b) The coulomb barrier

(c) The radioactivity of the products (d) The danger of an explosion.

(xx) Binding energy of a deuteron is

(a) 2.22 Mev (b) 2.80 Mev (c) 2.3 Mev (d) None of these

PART-II

NOTE:**(i)** **PART-II** is to be attempted on separate Answer Book.

(ii) **Attempt ONLY FOUR questions from PART-II. All questions carry EQUAL marks.**

(iii) **Extra attempt of any question or any part of the attempted question will not be considered.**

Q.2. (a) How can an LRC series circuit made to find the dielectric constant of a medium? **(10)**

(b) A 1.5-mH inductor in an ***LC*** circuit stores a maximum energy of 17 ***uj***. What is the peak current ***I***? **(10)**

Q.3. (a) Obtain Faraday's law of electromagnetic induction. Emphasize the role of the Lenz's law. **(7, 3)**

(b) A solenoid has length ***L*** = 1.23 m and inner diameter ***d*** = 3.55 cm. It has five layers of windings of 850 turns each and carries a current $\mathbf{i_0}$ = 5.57 A. What is ***B*** at its center? **(10)**

Q.4. (a) Discuss and explain the common-base static characteristics. **(10)**

(b) Where did Rayleigh and Jeans go wrong? How did Planck radiation formula account for the discrepancy in the black body radiations **(3,7)**

Q.5. (a) Is the Compton effect more supportive of the photon theory of light than the photoelectric effect? Explain your answer. **(4,6)**

(b) A bullet of mass 41 g travels at 960 m/s. What wavelength can we associate with it? Why does the wave nature of the bullet not reveal itself through diffraction effects? **(6,4)**

Q.6. (a) How does the Rutherford orbital motion violate the classical physics? **(10)**

(b) Discuss the modification suggested in the Bohr's atomic model to account for the nuclear motion and the hydrogenic atoms. **(10)**

Q.7. (a) In what basic ways do the so-called strong force and the electrostatic force differ? Explain your answer. **(10)**

(b) Analysis of Potassium and Argon atoms in a moon rock sample by a mass spectrometer shows that the ratio of the number of (stable) ^{40}Ar atoms present to the number of (radioactive) ^{40}K atoms is 10.3. Assume that all the Argon atoms were produced by the decay of Potassium atoms, with a half-life of 1.25 X 10^9 y. How old is the rock? **(10)**

Q.8. Write notes on **ANY TWO** of the following: **(10 + 10 = 20)**

(a) Schrödinger's wave equation (b) Nuclear Fission and fusion

c) Semiconductors and applications

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