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CSS Past Paper

Physics

(2019)

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

Roll Number

PHYSICS, PAPER-I

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)** Explain the Divergence of a Vector field with its physical significance? (10)
(b) A rural mail carrier leaves the post office and drives 22.0 km in a northerly direction. He then drives in a direction 60.0° south of east for 47.0 km. What is his displacement from the post office? (5)
(c) Vectors $\vec{C}$ *and* $\vec{D}$ have magnitudes of 3 units and 4 units, respectively. What is the angle between the directions of $\vec{C}$ *and* $\vec{D}$ if $\vec{C}.\vec{D}$ equals (a) zero, (b) 12 units and (c) -12 units? (5) **(20)**

Q. 3. **(a)** Distinguish between Linear and Angular momentum. Explain the laws of conservation of Angular momentum. (10)
(b) Estimate the net force needed to accelerate (i) a 1000kg car at ½ g; (ii) a 200g apple at the same rate. (5)
(c) A vertical force is applied to a block of mass m that lies on a floor. What happens to the magnitude of the normal force on the block from the floor as magnitude F is increased from zero if force is (a) downward and (b) upward? (5) **(20)**

Q. 4. **(a)** Describe the Michelson - Morley Experiment and show how negative results obtained from this experiment were interpreted? (10)
(b) Derive equation of Lorentz velocity transformations and show that speed of light is independent of the relative motion between the frames of reference. (10) **(20)**

Q. 5. **(a)** What is surface tension? How surface tension is responsible for rising of liquid in capillaries? (10)
(b) Water circulates throughout a house in a hot-water heating system. If the water is pumped at a speed of 0.50 m/s through a 4.0cm diameter pipe in the basement under a pressure of 3.0 atm, what will be the flow speed and pressure in a 2.6cm diameter pipe on the second floor 5.0 m above? Assume the pipes do not divide into branches. (5)
(c) When blood pressure is measured, why must the cuff be held at the level of the heart? (5) **(20)**

Q. 6. **(a)** What is polarization of waves? How plane polarized light can be obtained by a polarization sheet. (10)
(b) Two flat mirrors are perpendicular to each other. An incoming beam of light makes an angle of 15° with the first mirror. What angle will the outgoing beam make with the second mirror? (5)
(c) Since the density of air decreases with an increase in temperature, but the bulk modulus B is nearly independent of temperature. How would you expect the speed of sound waves in air to vary with temperature? (5) **(20)**

Q. 7. **(a)** State and explain Equipartition Theorem. (10)
(b) Define laws of thermodynamics. Explain 3rd law of thermodynamics in detail. (10) **(20)**

Q. 8. Write the short notes on any TWO of the following: (10 each) **(20)**
(a) Gyrocope **(b)** Classical Maxwell-Boltzmann Statistics
(c) Spin and Precession

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PART-I(MCQS): MAXIMUM 30 MINUTES	**PART-II MAXIMUM MARKS = 80**

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

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Reach out to us @ info@thinked.co
If you are interested in writing for us email us at writeforthinked@thinked.co