FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION - 2016
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) Candidate must 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 attempted question will not be considered.
(vii) **Use of Calculator is allowed.**

PART-II

Q. No. 2. (a) State and prove Stoke's theorem. **(8)**
(b) Prove that if the vector is the gradient of a scalar function then its line integral around a closed curve is zero. **(4)**
(c) A particle moves along the curve $\mathbf{x = 2t^2}$, $\mathbf{y = t^2 - 4t}$, $\mathbf{z = 3t-5}$ where t is the time. Find the components of its velocity and acceleration at time **t=1** in the direction **2i-3j+2k** **(8)**

Q. No. 3. (a) What is moment of inertia? State and prove parallel axis theorem. **(12)**
(b) Calculate rotational inertia of a hollow cylinder about cylindrical axis. **(8)**

Q. No. 4. (a) State and prove the Kepler's law of areas and Kepler's law of periods of planetary motion. **(8)**
(b) A satellite orbits at a height of 230km above the Earth surface. What is the period of satellite? **(6)**
(c) At what altitude above the earth surface the value of 'g' is three quarters of its value at the surface of the earth. **(6)**

Q. No. 5. (a) What is diffraction grating? Explain how grating diffracts light. Derive relation for resolving power of grating. **(12)**
(b) What is meant by polarization of light? How can we get a plane polarized light by a polarizing sheet? **(8)**

Q. No. 6. (a) Derive equation of Lorentz velocity transformations and show that speed of light is independent of the relative motion between the frames of reference. **(12)**
(b) The siren of a police car emits a source tone at a frequency of 1125 Hz. Find the frequency that would you receive in your car under the following circumstances. **(8)**
(i) Your car at rest, police car moving towards you at 29 m/s.
(ii) Police car at rest , your car moving towards it at 29 m/s.
(iii) Your and police car are moving towards one another at 14.5 m/s.
(iv) Your car moving at 9 m/s, police car chasing behind you at 38 m/s.

Q. No. 7. (a) Define Entropy. State Second law of thermodynamics in terms of Entropy. **(8)**
(b) Discuss applications of First Law of thermodynamics. **(6)**
(c) Discuss briefly the Lissajous patterns. **(6)**

Q. No. 8. Explain any FOUR of the following terms. **(05 each)** **(20)**
(a) Doppler's Effect
(b) Bernoulli's theorem
(c) Newton's rings
(d) He-Ne Gas LASER
(e) Brownian motion

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Roll Number

PHYSICS, PAPER-II

TIME ALLOWED: THREE HOURS **PART-I(MCQS): MAXIMUM 30 MINUTES**	**PART-I (MCQS)** **PART-II**	**MAXIMUM MARKS = 20** **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) Candidate must 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 attempted question will not be considered.
(vii) **Use of Calculator is allowed.**

PART-II

Q. No. 2.
(a) Define electric field intensity $\vec{E}$. State its value for a point charge and give its units. **(8)**
(b) State differential form of Gauss's law and from there develops the poisson's & Laplace's equations. **(8)**
(c) A charge of $10\sqrt{2}$ Coulomb is located at $(3\hat{i} + 4\hat{j} + 5\hat{k})m$. Calculate the electric field intensity at a point having position vector $(5\hat{i} + 4\hat{j} + 3\hat{k})m$. **(4)**

Q. No. 3.
(a) Differentiate between a series and parallel resonant circuits. **(6)**
(b) Explain the construction and operation of a transformer. What are energy losses in a transformer and how are they reduced to a minimum. **(10)**
(c) A series *LCR* circuit contains a coil with L=2.25H, a capacitor having C=16μF and a resistor with R=50Ω. Calculate the impedance and the phase difference between current and voltage. (Take frequency f = 50Hz) **(4)**

Q. No. 4.
(a) State and explain the basic postulates of Quantum Physics. **(5)**
(b) Briefly explain with examples what do you mean by Eigen function and Eigen values. **(5)**
(c) Derive the time-dependent Schrodinger Wave Equation for a free particle. **(10)**

Q. No. 5.
(a) Why the resistivity of metals increases with temperature but that of semiconductor decreases? **(6)**
(b) In the process of making semiconductor devices, why silicon is preferred over Germanium? **(4)**
(c) Briefly explain the construction and operation of a Bipolar Junction Transistor (BJT). How it can be used as an Amplifier? **(10)**

Q. No. 6.
(a) What do <111>, [010], (111), and {100} represents for a cubic crystal lattice. **(5)**
(b) What is packing factor? Determine the Atomic Packing factor of FCC lattice. **(5)**
(c) With neat diagram showing X-ray diffraction, derive an expression for Bragg's Law. **(10)**

Q. No. 7.
Define Curie and Becquerel. Establish the relation between them. **(6)**
Calculate the Decay Constant for ^{14}C which has half-life of 5730 years. **(4)**
State and explain Half-life and Mean life of a radioactive element. Show that $< T >$ is greater than $T_{1/2}$. **(10)**