PUNJAB PUBLIC SERVICE COMMISSION

COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE, ETC -2021 CASE NO. 3C2022

SUBJECT: PHYSICS (PAPER-I)

TIME ALLOWED: THREE HOURS **MAXIMUM MARKS: 100**

NOTE:
i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
iv. Extra attempt of any question or any part of the question will not be considered.

Attempt any FIVE questions in All. Attempt in Urdu or English.

Q.No.1 (a) Differentiate between gradient and divergence of a vector by giving two examples of each. **(5+5=10 Marks)**

(b) If A, B and C are vectors then show that

$$\mathbf{A.(B\times C) = B.(C\times A) = C.(A\times B)}$$ **(10 Marks)**

Q.No.2 (a) Differentiate between Conservative and Nonconservative Forces. **(4 Marks)**

(b) Write down Newtonian laws of motion. **(6 Marks)**

(c) Prove that the line integral of a vector field **A vector** around any closed curve is equal to the surface integral of the curl of **A vector** taken over any surface **S** of which the curve is a bounding edge. Mathematically **(10 Marks)**

$$\oint_C \vec{A}.\vec{dl} = \iint_S (\vec{\nabla}\times\vec{A})\ .d\vec{S}$$

Q.No.3 (a) Differentiate between elasticity and viscosity with the help of examples. **(4 Marks)**

(b) Prove that **(8 Marks)**

$$P+\frac{1}{2}\rho v^2+\rho gh = \text{constant}$$

(c) Write down a note on Gyroscope. **(8 Marks)**

Q.No.4 (a) Write down the Postulate of special theory of relativity. Write down the Lorentz transformation equation. **(6+4=10 Marks)**

(b) State and explain the three Kepler's laws of planetary motion. **(10 Marks)**

Q.No.5 (a) Differentiate between longitudinal and transverse waves. Also discuss standing waves and travelling waves. **(6+6=12 Marks)**

(b) Define Simple Harmonic Motion. Derive equation of motion of Simple Harmonic Oscillator and write its solution. **(8 Marks)**

Q.No.6 State and explain the laws of thermodynamics in detail. **(20 Marks)**

Q.No.7 What is LASER? Describe its construction, working and applications. **(20 Marks)**

Q.No.8 **Write down note on the followings:** **(7+7+6=20 Marks)**

(i) Maxwell's equations in thermodynamics
(ii) Newton's Ring
(iii) Maxwell-Boltzmann Statistics