Que 36 State the role of Mechanics in Physics.

Mechanics is a very important branch of physics which helps to study the motion and forces. With the understanding of motion it also helps to know how the particles in motion will react to an external force. Thus helps in predicting the behaviour.

Que 37. Explain coulomb's law?

Coulomb's law helps us to determine the electrostatic force between two charged particles.

It states that the electrostatic force between two charged particles is directly proportional to the product of the magnitude of the charges ($q_1 q_2$) and inversely proportional to the square of the distance (r) between them.

Columb's law is expressed as -

$$F = \frac{k(q_1 q_2)}{r^2}$$ here k is columb's constant $= 9 \times 10^9 \ N m^2/C^2$

Que 38 Explain population Inversion of the Gain Medium.

Population inversion is used in lasers. It refers to a state in which a higher number of atoms or molecules are in an excited state compared to a lower state. Also the gain medium is required in which population inversion is performed. It provides a favourable environment for this operation.

Que 39 What are the causes of ~~attenu~~ attenuation?

The reduction in the strength or intensity of a signal as it travels through a medium is called attenuation. Some common cause of attenuation are-

i) When a signal travels through a cable ~~or~~, the resistance in the cable causes the signal to loose strength in the form of heat.
ii) In optical fibres, the presence of impurities lead to decrease the strength of signal.
iii) The signals with higher frequencies experiences more attenuation.

Attenuation is caused by many factors. To maintain the efficiency of signal ~~the~~ we need to take many factors under consideration.

Ques Define the Terms Step index & graded index.

Step Index => Step index is a optical fibre design. In a step index fibre, the refractive index is higher than of the surroundings of cladding.
Step index fibre consists of two main parts: The core is the central region which have higher refractive index compared to the cladding. While the other part is cladding, it is the outer layer of core. It has lower refractive index compared to the core.

Graded Index => Graded index is also a type of optic fibre. It is introduced to reduce the dispersion of light as it change the refractive index gradually in the core which increases the efficiency of light.
It's structure is same as step index but inside the core the refractive index increases gradually to the centre. The cladding in the graded index constantly low.

Que 41- Describe the simple application of Gauss's law in detail.

Gauss's law is used in electromagnetism. It is used to calculate electric field is symmetry, such as cylinder, sphere.

Gauss Law is expressed as-

$$\oint_{sv} E.dA = \frac{Q}{\epsilon_0}$$

A simple Application for Gauss law is to calculate electric field, in a sphere

Let a sphere of radius R with a charge Q uniformly distributed.

electric flux = $\oint_{sv} E.dA = \mathcal{E}.4\pi r^2$ $\mathcal{E}$ = magnitude of electric field

According to law →

$$\mathcal{E}.4\pi r^2 = \frac{Q_{enc}}{\epsilon_0}$$