PG (NEW) CBCS
M.Sc. Semester-I Examination, 2019
PHYSICS
PAPER: PHS-103

Full Marks: 40 **Time: 2 Hours**

Write the answer for each unit in separate sheet

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

PHS 103.1: ELECTRODYNAMICS

Marks: 20

1. Attempt any two of the following: **(2× 2 = 4)**

a. What is radiation resistance? Why short linear antenna is an inefficient radiator?

b. Show that $C^2B^2-E^2$ is invariant under Lorentz transformation.

c. Show that the charge particle in uniform motion will not radiate energy.

d. Why electron temperature in plasma higher than ion temperature?

2. Attempt any two of the following: **(4 ×2=8)**

a. From relativistic Larmour's formula find the Bremstralung radiation and Cyclotron radiation energy loss.

b. Show that for propagation of e-m wave in plasma the minimum frequency should be $9\sqrt{n_0}$.

c. Show that Maxwell's equations are relativistically invariant.

d. How does the charge density and current density transform under Lorentz transformation?

3. Answer any one question of the following: **(8×1=8)**

a. Find the fourth component of Lorentz force density vector. Show that four Maxwell's equations can be represented by co-variant tensor form. **(6+2)**

b. What do you mean by scattering light and scattering cross section? Derive the expression for the scattering of EM waves with harmonically bound electron. **(2+4+2)**

(Turn Over)

PHS 103.2: MATERIALS PREPARATION AND CHARACTERIZATION

Marks: 20

1. Answer any two questions of the following: **(2x2=4)**

a. What do you mean by MOCVD?
b. What is e-gun?
c. What is the difference between XPS and XRD?
d. What do you mean by Stoke's line and Anti Stoke's line in RAMAN?

2. Answer any two questions of the following: **(2x4=8)**

a. Draw the schematic of TEM instrument showing the major parts of it.
b. Explain the idea of Sol-Gel synthesis technique. Is it a top-down approach?
c. If electron beam interact with matter then what are the different possibilities arise?
d. Explain the basic principle of thermal analysis of an unknown materials. What are the different ways to measure it?

3. Answer any one question of the following: **(1x8=8)**

a. i. What do you mean by probe microscopy?

ii. How it is different from electron microscopy?

iii. Give the basic principle of STM measurement.

iv. What is UHV? **(2+2+3+1)**

b. i. What do you mean by nano materials? Give example.

ii. What is the difference between glass and crystalline solid?

iii. Describe the process of V.L.S technique to grow one dimensional structure.

iv. What is the temperature of liquid N_2? **(2+2+3+1)**

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