Ref. No. Ex./M.Sc./Inst./II/I/304A/42/2017

Master of Science (Instrumentation) Examination, 2017

(2nd Year, 1st Semester)

Paper XIV (T-304A)

Plasma Based instrumentation and Laser

Time: Two hours **Full Marks: 50**

Section –I

Answer any four questions

1 Find the expression of electron temperature.Describe the double probe method for measurement of plasma parameters 4+6

2. Derive dispersion relation for electromagnetic wave propagation in an unmagetized plasma. Draw dispersion curve and find group velocity and phase velocity. Describe the mechanism of radio wave reception via ionosphere. 5+1+1+1+2

3.Find out the upper hybrid frequency for electrostatic electron oscillation perpendicular to the Magnetic field.How the existence of upper hybrid frequency can be verified experimentally. 6+4

4. Write down the Nuclear Fusion Reactions happening in stars.Drive Lawson criterion for Fusion Reaction. Describe the basic mechanism of Inertial Confinement Fusion. 2+5+3

5. Write short notes on 5+5

(a) MHD Power generation (b)Plasma Torch

Section-II

Answer one question

1. (a) Explain the working principle of a basic laser system with the help of its main components. (b) Show that the probability of absorption of radiation (B_{12})is equal to theprobability of stimulated emission (B_{21}). (c) Also find the ratio of probability of spontaneous emission (A_{21}) to stimulated emission (B_{21}). (d) Find the ratio of the rates of the stimulated and spontaneous emission at $T = 10^3$ K for visible radiation of wavelength 600 nm and microwave radiation of wavelength 300 mm. Comment on the result comparing the ratios. 3+3+1+3
2. (a) Write a note on ruby laser. Why this laser gives pulsed output? (b) What are the usages of CO_2 laser? (c) A laser beam of wavelength $\lambda = 6000$ Å, power 10 mW and angular spread 1.5 x 10^{-4} rad is focussed by a lens of focal length 10 cm. Find the (i) radius, (ii) power density of the image and (iii) coherence width. 5+2+3