

**M.A./M.Sc. Examination, 2017**  
**Semester-IV**  
**Mathematics**  
**Course: MMO-41**  
**( Plasma Dynamics-II )**

**Time: Three Hours**

**Full Marks: 40**

*Questions are of value as indicated in the margin.*  
Notations and Symbols have their usual meaning.

**Group - A**

Answer any *two* questions.

1. Use tanh method to obtain the soliton solution of modified KdV equation and ZK equation. 4+4=8
2. Explain a classical plasma model of your choice. Write down the fluid equations. Find the group velocity and phase velocity of the linear wave after proper normalization and linearization of the equations. 2+2+4=8
3. Write down Sagdeev's equation for a plasma model. Compare Sagdeev's equation with Newton's potential equation. Explain the conditions for existence of soliton and double layer for Sagdeev's technique. 2+2+4=8

**Group - B**

Answer any *two* questions.

4. Write down an classical plasma model where ions are mobile and electron obey non-thermal distribution. Use RPT to obtain the cylindrical KdV equation. Obtain the soliton solution in absence of nonplanar term. 3+6+3=12
5. Starting from fluid equations to obtain the Burger equation of a plasma model of your choice by using a suitable perturbation technique. Obtain travelling wave solution. 8+4=12
6. Find the Sagdeev's Pseudopotential of an  $e-i$  plasma where ions are mobile and electrons obey K distribution. Show that the shape of the exact solution may be obtained from the relation

$$\int_{\varphi_0}^{\varphi} \frac{d\varphi}{\sqrt{-2\psi(\varphi)}} = \pm \xi.$$

Obtain the soliton solution in small amplitude limit.

6+3+3=12

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