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SEAT No. :

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T.Y.B.Sc.

PHYSICS

PH-331 : Mathematical Method in Physics - II

(2013 Pattern) (Semester - III) (Paper - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*

Q1) Attempt all of the following: (One mark each)

[10]

- a) Write generating function for Hermite polynomials.
- b) State the postulate of special theory of relativity.
- c) State Fuch's theorem.
- d) State degree of differential equations.
- e) Define orthogonal co-ordinate system.
- f) Define Metric coefficients.
- g) What is length contraction?
- h) What is partial differential equation? Give one example.
- i) What is co-ordinate system.
- j) State order and degree of differential equation $\frac{d^3 y}{dx^3} + \frac{\sqrt{d^2 y}}{dx^2} + x = 0$

Q2) Attempt any two of the following: (5 Mark each)

[10]

- a) Prove that $J_{n+1}(x) + J_{n-1}(x) = \frac{2n}{x} J_n(x)$.
- b) Derive an expression for length contraction on the basis of lorent's transformation equation.
- c) Find the element of are length and volume element in cylindrical co-ordinates.

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Q3) Attempt any two of the following: (5 Mark each) **[10]**

- a) Show that the point $x=0$ is a regular singular point of the Bessel differential equation $x^2y''+xy'+(x^2-n^2)y=0$.
- b) Prove that the spherical polar co-ordinate system is orthogonal.
- c) Show that the point $x=\infty$ is a regular singular point of the Legendre's differential equation $(1-x^2)y''-2xy'+l(l+1)=0$.

Q4) a) Attempt any one of the following: **[8]**

- i) Obtain power series solution of $y''-2xy'+2\lambda y=0$ for $x=0$.
- ii) Describe Michelson-Morley experiment and explain the physical significance of negative result.

b) Attempt any one of the following: **[2]**

- i) Prove that $P_n(1)=1$.
- ii) What is the increase in relativistic mass of a particle of rest mass 1 gm when it is moving with velocity $0.8c$?

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