

Day : Tuesday
Date : 10/04/2018

S-2018-0732

Time : 03.00 PM TO 05.00 PM
Max. Marks : 40.

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate full marks.
- 3) Use of electronic calculator/ log table is allowed

Q.1 Answer any **TWO** of the following: (10)

- a) Set-up the transformation equation for Cartesian co-ordinates and cylindrical co-ordinates.
- b) If $u = 2x + 3$, $v = y - 4$, $w = z + 2$. Show that u, v, w , are orthogonal and find ds^2 . Also calculate numerical co-efficient h_1, h_2 and h_3 .
- c) Use the method of separation of variables to solve Helmholtz equation in Cartesian co-ordinates.

Q.2 Answer any **TWO** of the following: (10)

- a) Show that the point $x = \infty$ is an irregular singular point of differentiation equation $y'' + w^2y = 0$.
- b) Prove that $H_{n+1}(x) = 2xH_n(x) - 2nH_{n-1}(x)$.
- c) Prove that $p'_{n+1}(x) + p'_{n-1}(x) = 2xp'_n(x) + p_n(x)$.

Q.3 Answer any **TWO** of the following: (10)

- a) With neat labelled diagram explain Michelson-Morley experiment with negative result.
- b) Obtain the relativistic formula for the variation of mass with velocity.
- c) Obtain the solution of wave equation in cylindrical co-ordinates.

Q.4 Answer any **FIVE** of the following: (10)

- a) Find the polar and cylindrical co-ordinates of a point $(3, 4, -5)$.
- b) A rod of 1m long is moving along with length with a velocity $0.66c$. Calculate its length as it appears to an observer on the earth.
- c) Prove that $p_n(1) = 1$.
- d) Write a note on time dialation.
- e) Define (i) co-ordinate surfaces (ii) co-ordinate axer.
- f) Show that the point $x = 0$ is an ordinary point of the Hermite's differential equation $y'' - 2xy'' + 2\lambda y = 0$ where λ is constant.
- g) State Fuch's theorem.