PHY-HC-3016
Sessional Examination-2021

Time – 1 hr

Marks - 30

1. Using series solution method find the solution of any one of following equation –

a) $\frac{d^2y}{dx^2} + \omega^2 y = 0$

b) $y'' + xy' + y = 0$ 7

2. Write the order and degree of following equation

$\frac{d^2y}{dx^2} = -ky$ 1

3. State Fuchs theorem and check whether following equation has solution or not

$y'' + x^{-1}y' - x^{-2}y = 0$ 2+2=4

4. Show that $(1-2xt+t^2)^{-\frac{1}{2}}$ is the generating function of Legendre polynomial

or

Prove the following recurrence relation of Legendre polynomial

$P_{n-1}' = xP_n' - nP_n$ 4

5. What do you mean by idempotent matrix 1

6. Answer any three questions - 3×3=9

a) Define complex conjugate matrix, Hermitian matrix and skew Hermitian matrix

b) Show that for three matrices A, B & C that $(AB)C = A(BC)$

c) Find the cofactor matrix of $A = \begin{pmatrix} 3 & 2 & 1 \\ 1 & 4 & 5 \\ 2 & 3 & 1 \end{pmatrix}$

d) Show that for a matrix A

$A.(\text{adj } A) = (\text{adj } A).A = |A| I$

7. Define Gamma function $\Gamma(n)$. Show that 1+3=4

$\Gamma(n+1) = n\Gamma(n)$

or

$\Gamma(n+1) = n!$