

NORTH GAUHATI COLLEGE
DEPARTMENT OF PHYSICS
PAPER: MATHEMATICAL PHYSICS II
(PHY-HC-3016)
ASSIGNMENT-1

Total marks: 15

1. Solve the following: 2×4 = 8
- a) $nP_n = (2n-1)xP_{n-1} - (n-1)P_{n-2}$
- b) $P'_{n+1}(x) - P'_{n-1}(x) = (2n+1)P_n(x)$
- c) $\Gamma(1/2) = \sqrt{\pi}$
- d) $\Gamma m \Gamma(1-m) = \frac{\pi}{\sin m\pi}$
2. Using Fourier series solve: 2×2 = 4
- If $f(x) = x$ for $0 < x < \frac{\pi}{2}$
- $= \pi - x$ for $\frac{\pi}{2} < x < \pi$
- then show that
- a) $f(x) = \frac{4}{\pi} \left(\sin x - \frac{1}{3^2} \sin 3x + \frac{1}{5^2} \sin 5x + \dots \right)$
- b) $f(x) = \frac{\pi}{4} - \frac{8}{\pi} \left(\frac{1}{2^2} \cos 2x + \frac{1}{6^2} \cos 6x + \dots \right)$
3. Solve the Laplace's equation in 2D cylindrical coordinate system. 3

Submission date: 10/08/2021