Government General Degree College, Chapra

Internal Assessment- 1st Semester, 2019-20

Sub.- Physics

Paper: MATHEMATICAL PHYSICS-I

Total Marks: 15   Time: 40 minutes

Answer any three questions only:

1. (a) Solve the differential equation $(x + 1)\frac{dy}{dx} - y = e^x (x + 1)^2$.   3

   (b) Find the Taylor series expansion of lnx about $x = 2$.   2

2. Solve the equation –

   $y'' + 6y' + 8y = 0$, subject to the condition $y = 1, y' = 0$ at $x = 0$,

   where, $y' = \frac{dy}{dx}$ and $y'' = \frac{d^2y}{dx^2}$.   5

3. (a) Find a unit vector normal to $\vec{A} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$.   2

   (b) Using Stoke's law, prove that $\vec{\nabla} \times \vec{\nabla}\emptyset = 0$.   3

4. (a) The position vectors of three points A, B and C are $\vec{r_1} = \hat{i} + 2\hat{j} + \hat{k}, \vec{r_2} = 3\hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{r_3} = 2\hat{i} + 2\hat{j} - 3\hat{k}$. Find the area of the triangle.   3

   (b) $\vec{\omega}$ is a constant vector and $\vec{r}$ is the position vector of a point. If $\vec{v} = \vec{\omega} \times \vec{r}$, then prove that $\vec{\nabla}.\vec{v} = 0$.   2