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B. Sc. (Hons.) Physics 2nd Sem. Latest

Examination – April, 2018

MATHEMATICAL PHYSICS-II

Paper : Phy-201

Time : Three Hours]   *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all selecting at least *two* questions from each Unit. All questions carry equal marks.

UNIT – I

1. State rules for finding the complementary function of a nth order differential equation of the type $(D^n + k_1 D^{n-1} + ... + k_n)y = 0$ in different cases. If y_1 and y_2 are two solutions of this equation, prove that $c_1 y_1 + c_2 y_2$ is also its solution.   8

2. Find complete solution of the following differential equation, $(1 - x^2)d^2y/dx^2 - 2x(dy/dx) + n(n+1)y = 0; n$ is a constant and discuss the results. **8**

3. Describe solution of Cauchy's homogenous equation.
Solve $x^2 d^2y/dx^2 + x(dy/dx) + y = \log x \sin(\log x)$. **8**

4. (i) Determine the singular points at infinity of $x^2 d^2y/dx^2 - 2x(dy/dx) + p^2 y = 0$ where p is an integer. **8**

(ii) Find complete solution of the equation $(D-2)^2 = 8(e^{2x} + \sin 2x + x^2)$. **4**

UNIT – II

5. (i) Represent the following function in Fourier series.

$$F(x) = \begin{cases} -\sin x, & -\pi \le x < 0 \\ \sin x, & 0 < x \le \pi \end{cases}$$ **4**

(ii) Show that :

$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\sin nx}{n} = \frac{x}{2}$$ **4**

6. (i) Represent the function $x \sin x$ in Fourier series. **4**

(ii) Find the value of $\Sigma 1/n^2$ using Fourier series for the function $f(x) = x^2$. **4**

7. Explain various types of errors. A balloon is form of right circular cylinder of radius 1.5 m and length 4m and is surmounted by hemispherical ends. If the radius increased by 0.01 m and length by 0.05 m, find the percentage change in volume of the balloon. **8**

8. Explain Fourier sine and cosine series. Obtain the Fourier series representation for a full wave rectifier. **8**

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