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B.Sc. (Hons.) Physics (Semester – 3rd)

MATHEMATICS-III

Subject Code: BMATH5301

Paper ID: [19131514]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1 Attempt the following:

- a Define the linear Bernoulli equations.
- b Write the condition for exact differential equation.
- c Define the order of differential equation with examples
- d What is meant by the degree of a differential equation?
- e Write the Laplace equation with example.
- f Write the one dimensional heat equation.
- g Define the first order partial differential equations with example.
- h Determine the partial derivative of the function: $f(x, y) = 3x + 4y$.
- i Give one example of a second-order partial differential equation.
- j Write the one dimensional wave equation.

Section – B

(5 marks each)

Q2 Find the solution for the differential equation $(2xy - \sin x) dx + (x^2 - \cos y) dy = 0$.

Q3 Show that if a is a constant, then $u(x, t) = \sin(at) \cos(x)$ is a solution to $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$

Q4 Solve $2 \frac{\partial^2 z}{\partial x^2} + 5 \frac{\partial^2 z}{\partial x \partial y} + 2 \frac{\partial^2 z}{\partial y^2} = 0$.

Q5 Solve $\frac{d^2 y}{dx^2} + 4y = 0$.

Q6 Solve $(1 - x) dy + (1 - y) dx = 0$.

Section – C

(10 marks each)

Q7 Solve $y + px = x^4 p^2$.

Q8 Solve $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} - 3y = 5$.

Q9 By eliminating the arbitrary functions, obtain the partial differential equations from

$$z = f(x + c\,t) + g(x - c\,t).$$