# DHANAMANJURI UNIVERSITY

**Examination-2024 (Dec)** 

Four year course B.Sc./B.A. 3<sup>rd</sup> Semester

Name of Programme		:	<b>B.Sc./B.A.</b> Mathematics
Paper Type		:	Theory
Paper Code		:	CMA-208
Paper Title		:	<b>Partial Differential Equations</b>
Full Marks :	80		
Pass Marks :	32		<b>Duration: 3 Hours</b>

The figures in the margin indicate full marks for the questions: Answer all the question.

# 1. Choose and rewrite the correct answer for each of the following questions: $1 \times 3 = 3$

a) The partial differential equation obtained by eliminating the arbitrary constants aand b from the equation z = a(x + y) + b is

i) $p + q = 0$	ii) $p - q = 1$
iii) $pq = 0$	iv) $p - q = 0$

b) The complete integral of f(p,q) = 0 is i) z = x + y + cii) z = ax + by + civ) z = ax + b

c) The order of the partial differential equation r + 2s - 3t = xy is

- i) 1 ii) 2
- iii) 3 iv) 4

# 2. Write very short answer for each of the following

#### questions:

 $1 \times 6 = 6$ 

- a) Define complete integral of a first order partial differential equation.
- b) Give an example of semi linear first order partial differential equation.
- c) Write the complete integral of  $q = 3p^2$ .
- d) What is the complete integral of Clairaut's equation ?
- e) If  $(D^2 D'^2 + D D')z = 0$ . Write its solution.

## **3.** Write short answer for each of the following: $3 \times 5 = 15$

- a) Solve: (mz ny)p + (nx lz)q = ly mx.
- b) Find the complete integral of the form (p, q, z) = 0.
- c) Solve: $p^2 + q^2 = 1$ .
- d) Solve:  $(D^2 2DD' + D'^2)z = 12xy$ .
- e) Solve:  $t xq = x^2$ .

## 4. Write answer for each of the following questions: $4 \times 5 = 20$

a) Derive the partial differential equation by eliminating arbitrary function.

b) Solve: 
$$\frac{(y-z)p}{yz} + \frac{(z-x)q}{zx} = \frac{x-y}{xy}$$
.  
c) Solve:  $z = px + qy + c\sqrt{(1+p^2+q^2)}$   
d) Solve:  $(D^3 - 4D^2D' + 4DD'^2)z = 4\sin(2x+y)$ .

e) Solve:  $(D - 3D' - 2)^2 z = 2e^{2x} \tan(y + 3x)$ .

## 5. Answer any two of the following questions: $6 \times 2 = 12$

a) Form a partial differential equation by eliminating a, b, c from  $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ .

- b) Define Lagrange's linear equation. Derive Lagrange's solution of linear equation.
- c) Find the integral surface for the Cauchy problem  $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 1$ , which passes through the circle  $z = 0, x^2 + y^2 = 1$ .

#### 6. Answer any two of the following questions: $6 \times 2 = 12$

a) Solve: 
$$z^2(p^2 + q^2) = x^2 + y^2$$
.

- b) Find the
  - i) complete integral
  - ii) general integral
  - iii) singular integral of px + qy = pq by Charpit's method.
- c) Find complete integral of  $p_3x_3(p_1 + p_2) + x_1 + x_2 = 0$  by Jacobi's method.

#### 7. Answer any two of the following questions: $6 \times 2 = 12$

- a) Solve:  $r + s 6t = y \cos x$ .
- b) Solve:  $x^2 \frac{\partial^2 z}{\partial x^2} 4xy \frac{\partial^2 z}{\partial x \partial y} + 4y^2 \frac{\partial^2 z}{\partial y^2} + 6y \frac{\partial z}{\partial y} = x^3 y^4$ .
- c) Solve:  $pt qs = q^3$  by Monge's method.

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