

Reg. No

Name

M. Sc DEGREE END SEMESTER EXAMINATION - OCTOBER 2019**SEMESTER 3 : MATHEMATICS****COURSE : 16P3MATT11 : PARTIAL DIFFERENTIAL EQUATIONS***(For Regular - 2018 Admission and Supplementary - 2016/2017 Admissions)*

Time : Three Hours

Max. Marks: 75

Section A**Answer all Questions (1.5 marks each)**

- Derive a partial differential equation from $z = f(xy/z)$
- Verify that the differential equation $yz(y+z)dx + xz(x+z)dy + xy(x+y)dz = 0$ is integrable
- Verify that the differential equation $yz dx + (x^2y - zx) dy + (x^2z - xy) dz = 0$ is integrable
- Find the complete integral of the equation $p^2y(1+x^2) = qx^2$
- Find the complete integral of the equation $pqz = p + q$
- Solve

$$\frac{\partial^3 z}{\partial x^3} - \frac{2\partial^3 z}{\partial x^2 \partial y} - \frac{\partial^3 z}{\partial x \partial y^2} + \frac{\partial^3 z}{\partial y^3} = 0$$

- Find the particular integral of

$$(D^2 - D')z = 2y - x^2$$

- Solve

$$r + s - 2t - p - 2q = 0$$

- Write the Laplace's equation
- State interior Dirichlet problem

(1.5 x 10 = 15)

Section B**Answer any 4 (5 marks each)**

- Verify that the differential equation $2y(a-x)dx + [z - y^2 + (a-x)^2]dy - ydz = 0$ is integrable and find its primitives
- Verify that the differential equation $(y^2 + yz + z^2)dx + (z^2 + xz + x^2)dy + (x^2 + xy + y^2)dz = 0$ is integrable and find its primitives
- Derive the condition for compatibility of system of first order partial differential equations

14. Solve

$$(D^2 - D')z = e^{2x+y}$$

15. Solve

$$(D^2 - 2DD' - 15D'^2)z = 12xy$$

16. Show that if a function z satisfies the differential equation $\frac{\partial^2 z}{\partial x^2} \frac{\partial z}{\partial y} = \frac{\partial^2 z}{\partial x \partial y} \frac{\partial z}{\partial x}$ it is of the form $f(x + g(y))$, where f and g are arbitrary

(5 x 4 = 20)

Section C**Answer any 4 (10 marks each)**

17.1. Find the surface which orthogonal to the one parameter system $z = cxy(x^2 + y^2)$ and which passes through the hyperbola $x^2 - y^2 = a^2, z = 0$

OR

2. Find the integral surface of pde $x^3p + y(3x^2 + y)q = z(2x^2 + y)$, which passes through the parabola $x = 1, y^2 = z - y$

18.1. Find the complete integral of the $p^2x + qy = z$ and hence derive the equation of the integral surface of which the line $y = 1, x + z = 0$ is a generator.

OR

2. Show that the integral surface of the equation $2y(1 + p^2) = pq$ which is circumscribe about the cone $x^2 + z^2 = y^2$ has the equation $z^2 = y^2(4y^2 + 4x + 1)$

19.1. (i) Solve $(D^2 - D')z = e^{x+y}$
 (ii) Solve $(r + s - 2t) = e^{x+y}$

OR

2. (i) Solve $r + 3s + 2t = x + y$
 (ii) Solve $(D^3 - 2D^2D' - DD'^2 + 2D'^3)z = e^{x+y}$

20.1. Describe Monge's method. Solve $r = a^2t$ using Monge's method

OR

2. Solve $pq = x(ps - qr)$ and solve the equation $r = t$ the wave equation using Monge's method.

(10 x 4 = 40)