DMM-3342
Second Year B. Sc. (Sem. - IV) Examination
March/April – 2016
Mathematics : MTH-402
(Partial Differential Equations)
(Old Course)

Time : 2 Hours
[Total Marks : 50]

Instructions :

(1) Fill up strictly the details of \( \text{Signs on your answer book.} \)

\[ \text{Name of the Examination:} \]
\[ \text{SECOND YEAR B. SC. (SEM. - IV)} \]

\[ \text{Name of the Subject:} \]
\[ \text{MATHEMATICS : MTH-402 (OLD COURSE)} \]

\[ \text{Seat No.:} \]

(2) All questions are compulsory.
(3) Digits to the right indicate full marks of the questions.
(4) Follow usual notations.

1 Answer the following : (any five) \[ 10 \]

(1) Write Auxiliary equation of \( p + q = \frac{z}{a} \).

(2) Find the complete solution of \( z = px + qy + f(p,q) \).

(3) Show that the solution of \( p.q = z \) is \( z = (x+a)(y-b) \).

(4) Obtain Charpit's Auxiliary equation for \( F(z,p,q) = 0 \).

(5) Find complementary function of \( \frac{\partial^2 z}{\partial x^2} - 9 \frac{\partial^2 z}{\partial y^2} = \cos(2x-3y) \).

(6) Find particular integral of \( \frac{\partial^2 z}{\partial x^2} - 16 \frac{\partial^2 z}{\partial y^2} = \sin(2x+3y) \).
(7) Write Charpit’s Auxiliary equation for \( F(x, y, z, p, q) = 0 \).

(8) Eliminate arbitrary constants \( a \) and \( b \) from
\[
z = ax + by + c = b.
\]

2 Answer the following: (any two)

(1) Obtain the partial differential equation by eliminating arbitrary constants \( a, b \) and \( c \) from \( \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1 \).

(2) Solve: \( x(y - z)p + y(z - x)q = z(x - y) \).

(3) Solve: \( xzp + yzq = x \cdot y \).

(4) Obtain the partial differential equation by eliminating an arbitrary function \( \phi(x + y + z, x^2 + y^2 + z^2) = 0 \).

3 Answer the following: (any two)

(1) Describe the method to solve \( f_1(x, p) = f_2(y, q) \)

(2) Solve: \( z = p \cdot q \)

(3) Solve: \( z - px - qy = p \cdot q \)

(4) Describe the method to solve \( F(p, q, z) = 0 \).

4 Answer the following: (any two)

(1) Show that the particular integral of
\[
(D^2 + k_1DD' + k_2D^{'2}) z = \sin(mx + ny)
\]
is given by
\[
PI = \frac{1}{f(-m^2, -mn, -n^2)} \sin(mx + ny)
\]
where \( f(D, D') = D^2 + k_1DD' + k_2D^{'2} \).

(2) Find the complete solution of \( (D^2 + k_1DD' + k_2D^{'2})Z = 0 \),
where \( D = \frac{\partial}{\partial x}, D' = \frac{\partial}{\partial y} \)
where \( k_1, k_2 \) are constants and the roots of auxiliary equation of it are real and equal.
(3) Solve: \((2D^2 + 5DD' + D'^2)z = 0\).

(4) Solve: \(\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial y^2} = 2e^{2x}\).

5 Solve the following: (any two) 10

(1) \((D^2 + DD' + D' - 1)z = e^x\).

(2) \((D + D' - 1)(D + 2D' - 3) z = 2 + x + y\).

(3) \((D + D' - 1)(D + 2D^2 - 3)z = 4 + 3x + 6y\).

(4) \((D^2 + 2DD' + D^2 - 2D - 2D') Z = \sin(x + 2y)\).