RAN - 7027

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B.Sc. (Sem. IV) Examination

March / April - 2019

Mathematics : MTH - 402
(Partial Differential Equations)

Time: 2 Hours] **[Total Marks: 50**

સૂચના : / Instructions

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **B.Sc. (Sem. IV)**

Name of the Subject :

☛ **Mathematics : MTH - 402 (Partial Differential Equations)**

Subject Code No.: **7 0 2 7**

Seat No.:

Student's Signature

(1) Digits to the right indicates marks of the question.
(2) Follow the usual notations.

Q-1. Answer the following : (any FIVE) **10**

(1) Form a partial differential equation by eliminating arbitrary constants a and b from $z = axe^y + \frac{1}{2} a^2 e^{2y} + b$.

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

(3) Find the complete integral of $p^3 + q^3 = 27$.

(4) Eliminate arbitrary function f from $z = f\left(\frac{x}{y}\right)$.

(5) Find C.F. of $2r + 5s + 2t = xy$.

(6) Find P.I. of $(D^2 - 2DD' + D'^2)\, z = e^{x-2y}$.

(7) Solve : $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} - 15\frac{\partial^2 z}{\partial y^2} = 0$

(8) Solve : $(D^2 + DD' + D' - 1)\, z = 0$

Q-2. **Answer the following : (any TWO)** **10**

(1) Obtain the partial differential equation by eliminating arbitrary Function φ from $\varphi(x + y + z,\ x^2 + y^2 + z^2) = 0$.

(2) Solve : $(y^2 + z^2)\, p - xyq + zx = 0$.

(3) Solve : $x^2(y - z)\, p + y^2(z - x)\, q = x^2(x - y)$.

Q-3. **Answer the following : (any TWO)** **10**

(1) Explain the method to solve the partial differential equation $F(z, p, q) = 0$

(2) Solve : $q = px + p^2$

(3) Solve : $(p^2 + q^2)\, x = pz$. (by Char pit's Method)

Q-4. **Answer the following : (any TWO)** **10**

(1) Find the C.F. of $(D^2 + k_1 DD' + k_2 D'^2)\, z = f(x, y);\ D \equiv \frac{\partial}{\partial x},\ D' \equiv \frac{\partial}{\partial x'}$ and k_1; k_2 are constant and roots of an auxiliary equation are real and equal.

(2) Solve : $\frac{\partial^2 z}{\partial x^2} + (a + b)\ \frac{\partial^2 z}{\partial x \partial y} + ab\frac{\partial^2 z}{\partial y^2} = xy$.

(3) Solve : $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = y \cos x$.

Q-5. **Answer the following : (any TWO)** **(10)**

(1) Show that the C.F. of $f(D, D')\, z = F(x, y)$ is given by $\phi_1(y + mx) + e^{cx}\phi_2(y + mx),\ f(D, D') = (D - mD')(D - mD' - c)$

(2) Solve : $[D^2 - DD' - 2D'^2 + 2D + 2D']z = e^{2x + 3y}$

(3) Solve : $(2DD' + D'^2 - 3D')\, z = 5 \cos(3x - 2y)$
