AC-3100

Second Year B. Sc. (Sem. IV) Examination

March/April – 2015

Mathematics : MTH - 402

(New Course)

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

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fillup strictly the details of ☛ signs on your answer book. Name of the Examination : ☛ SECOND YEAR B. SC. (SEM. IV) Name of the Subject : ☛ MATHEMATICS : MTH - 402 (NEW) ☛ Subject Code No. : 3 1 0 0 ☛ Section No. (1, 2,.....) : Nil	Seat No. : Student's Signature

(2) Digits to the right of each question indicate its marks.

(3) Follow usual symbols

(4) Use of scientific calculator is permissible.

(5) All question are compulsory.

1 Attempt **any 5** out of 8: **10**

(1) Write Lagrange's equation for $\cos x \dfrac{\partial Z}{\partial x} - \sec x \dfrac{\partial Z}{\partial y} = e^{-Z}$.

(2) Find the complete solution of F(p,q,) = 0.

(3) Obtain the Charpit's auxillary equations for F(z,p,q,)=0

(4) Obtain the solution of $p - q = \dfrac{z}{a}$.

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

(6) Obtain the complimentary function of $\dfrac{\partial^2 z}{\partial x^2} - 9\dfrac{\partial^2 z}{\partial y^2} = x^2$.

(7) Obtain the particular integral of $\dfrac{\partial z}{\partial x} - 6\dfrac{\partial z}{\partial y} = x^2$.

(8) Write Charpit's auxillary equations for F(x,y,z,p,q) = 0.

2 (a) Obtain the partial differential equation by eliminating arbitrary constants a and b from **5**

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=9.$$

OR

(a) Obtain the partial differential equation by eliminating arbitrary function ϕ from $\phi\left(x+y+z, x^2-y^2+z^2\right)=0$. **5**

2 (b) Solve **any 2** out of 4 : **10**

(1) $xzp+yzq=xy.$

(2) $(z^2-2yz-y^2)p+(xy+xz)q=xy-xz$

(3) $x(y-z)p+y(z-x)q=z(x-y).$

(4) $pz-qz=z^2+(x+y)^2$

3 (a) Describe the method of solving F(p,q) = 0. **5**

OR

(a) Describe the method of solving z = px + qy + f (p,q). **5**

3 (b) Solve **any 2** out of 4 : **10**

(1) $p(q^2+1)+(b-z)q=0.$

(2) $(p^2+q^2)y=qz.$

(3) $z-px-qy=p^2+q^2.$

(4) z = pq.

4 (a) Describe the method of finding the complete solution **5**

of $\left(D^2 + 4DD' + 3D'^2\right)z = 0$ where $D \equiv \frac{\partial}{\partial x}$ & $D' \equiv \frac{\partial}{\partial x}$.

OR

(a) Describe the method of finding the complete solution **5**

of $\left(D^2 + 2DD' + D'^2\right)z = 0$ where $D \equiv \frac{\partial}{\partial x}$ & $D' \equiv \frac{\partial}{\partial x}$.

4 (b) Solve **any 2** out of 4 : **10**

(1) $\left(2D^2 + 5DD' + D'^2\right)z = 0$.

(2) $\left(D^2 + 6DD' + 9D'^2\right)z = 0$.

(3) $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = \sin 2x \sin y$.

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

5 (a) Define the non-homogenous linear partial differential **5**

equation. Hence show that the complimentary function

of $f(D,D')\, z = f(x,y)$ is given by C.F. = $\varphi_1(y + mx) + e^{ex}\varphi_2(y + mx)$

where $f(D,D') \equiv (D - mD')(D - mD' - c)$.

OR

5 (a) Obtain Monge's equation from $r - t\cos^2 x + p\tan x = 0$. **5**

5 (b) Solve **any 2** out of 4 : **10**

(1) $\left(D^2 + 2DD' + D'^2 - 2D - 2D'\right)z = \sin(x + 2y)$.

(2) $\left(D^2 + DD' + D' - 1\right)z = e^{2x}$.

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

(4) $\left(D^2 + DD' + D' - 1\right)z = \cos(x + 2y)$.
