V.P. & R.P.T.P. Science College,V.V.Nagar

Internal Test: 2014-15

Subject : Mathematics US04CMTH02 Max. Marks : 25

Differential Equations

Date: 18/03/2015 Timing: 10.30 am - 12.00 pm

Instructions : (1) This question paper contains FIVE questions.
(2) The figures to the right side indicate full marks of the corresponding question/s
(3) The symbols used in the paper have their usual meaning, unless specified.

Q: 1. Answer the following by choosing correct answers from given choices. **3**

[1] Integral curve of $2xdx = dy = 2zdz$ is given by

[A] $x^2 + y = c_1, y + z^2 = c_2$ [B] $x^2 + y = c_1, y - z^2 = c_2$

[C] $x^2 + y = c_1, y + z^2 = c_2$ [D] $x^2 - y = c_1, y - z^2 = c_2$

[2] $ax + by - z = 1$ is a solution of

[A] px-qy-z=1 [B] qx-py-z=1

[C] p+y-z=1 [D] px+qy-z=1

[3] Integral surface of the linear partial differential equation $x^2p - y^2q = z^2$ can be obtained by solving the differential equation

[A] $\frac{dx}{z^2} = -\frac{dy}{x^2} = \frac{dz}{y^2}$ [B] $\frac{dx}{x^2} = \frac{dy}{y^2} = \frac{dz}{z^2}$

[C] $\frac{dx}{y^2} = -\frac{dy}{z^2} = \frac{dz}{x^2}$ [D] $\frac{dx}{x^2} = -\frac{dy}{y^2} = \frac{dz}{z^2}$

Q: 2. Answer any TWO of the following. **4**

[1] Find the integral curves of the equations $\frac{dx}{1+x} = \frac{dy}{1+y} = \frac{dz}{z}$

[2] Obtain partial differential equation of $ax - by + 4z = 12$

[3] Find a differential equation which can be solved to obtain integral curve of the linear partial differential equation $px^2 + qy^2 = z$

Q: 3. Solve the equation $\frac{dx}{y+\alpha z} = \frac{dy}{z+\beta x} = \frac{dz}{x+\gamma y}$ **6**

OR

Q: 3. Find the orthogonal trajectories of hyperboloids $x^2 + y^2 - z^2 = 1$ of the conics in which it is cut by the planes $x + y = c$ **6**

Q: 4. Define Paffian differential equation. Also prove that a necessary and sufficient condition that the Pfaffian differential equation $X.dr = 0$ is be integrable is that $X.curlX = 0$ **6**

OR

Q: 4 [A] Eliminate the arbitrary function f from the function $z = x + y + f(xy)$ **3**

[B] Solve : $x^2\dfrac{\partial z}{\partial x} + y^2\dfrac{\partial z}{\partial y} = (x+y)z$ **3**

Q: 5. Find the integral surface of the equation $x^2p + y^2q = -z^2$ which passes through the hyperbola $xy = x + y,\ \ z = 1$ **6**

OR

Q: 5. Find the surface which is orthogonal to one parameter system $z = cxy(x^2 + y^2)$ and which passes through the hyperbolas $x^2 - y^2 = a^2;\ z = 0$ **6**