

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

Internal Test: 2013-14

S.Y.B.Sc. : Semester - IV (CBCS)

Subject : Mathematics

US04CMTH02

Max. Marks : 30

Differential Equations

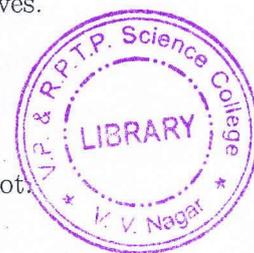
Date: 15/03/2014

Timing: 1.00 pm - 2.30pm

Q: 1. Answer any THREE of the following.

6

- [1] Discuss the method of obtaining orthogonal trajectories of a system of curves.
- [2] Find the integral curves of the equations $x.dx = y.dy = z.dz$
- [3] Obtain partial differential equation of $ax - by + 4z = 12$
- [4] Examine whether $ax - by + z = 7$ is a solution of $px + qy - z + 7 = 0$ or not.
- [5] Determine whether the equation $ydx + xdy = 5zdz$ is integrable or not.
- [6] Obtain partial differential equation of $ax - by + 4z = 12$



Q: 2 [A] Find the orthogonal trajectories on the conicoid $(x + y)z = 1$ of the conics in which it is cut by the system of planes $x - y + z = k$

4

[B] Solve : $\frac{dx}{x+z} = \frac{dy}{y} = \frac{dz}{z+y^2}$

4

OR

Q: 2 [A] Find the orthogonal trajectories of hyperboloids $x^2 + y^2 - z^2 = 1$ of the conics in which it is cut by the planes $x + y = c$

4

[B] Find the integral curves of the equations

$$\frac{dx}{y(x+y) + az} = \frac{dy}{x(x+y) - az} = \frac{dz}{z(x+y)}$$

4

Q: 3 [A] Prove that a Pfaffian differential equation in two variables always possesses an integrating factor

4

[B] Solve : $y^2p - xyq = x(z - 2y)$

4

OR

Q: 3 [A] If $f(u, v) = 0$ is a relation between u and v , where u and v are functions of x, y, z and z is a function of x and y then prove that partial differential equation of the relation is given by

$$\frac{\partial(u, v)}{\partial(y, z)}p + \frac{\partial(u, v)}{\partial(z, x)}q = \frac{\partial(u, v)}{\partial(x, y)}$$

4

[B] Determine whether the Pfaffian differential equation $z(z+y)dx+z(z+x)dy-2xydz = 0$ is integrable or not. Find its solution if it is integrable 4

Q: 4 [A] Find the surface which is orthogonal to the surface $z(x+y) = c(3z+1)$ and which passes through the circle $x^2 + y^2 = 1, z = 1$ 4

[B] Find the integral surface of the equation $x^2p + y^2q = -z^2$ which passes through the hyperbola $xy = x + y, z = 1$ 4

OR

Q: 4 [A] Define Complete Integral. Also verify $z^2 + \mu = 2(1 + \lambda^{-1})(x + \lambda y)$ is a complete integral of partial differential equation $z = \frac{1}{p} + \frac{1}{q}$. Also show that the complete integral is the envelope of the one-parameter subsystem obtained by taking $b = -\frac{a}{\lambda} - \frac{\mu}{1 + \lambda}$ in the solution $z = \sqrt{2x + a} + \sqrt{2y + b}$. 8

