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 : $\dfrac{dx}{x+z} = \dfrac{dy}{y} = \dfrac{dz}{z+y^2}$ **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 $xy=x+y,\quad z=1$ 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