SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY VASAD

B. E. Third Semester (2017-18)

Subject: Advanced Engineering Mathematics (2130002)

Tutorial: 9

Que.1 Form Partial differential equations from the following equations by arbitrary functions or constants.

(i) $ax^2+by^2+z^2=1$

(ii) $(x-a)^2+(y-b)^2+z^2=1$

(iii) $f\left(x+y+z, x^2+y^2+z^2\right)=0$

(iv) $z=y^2+2f\left(\frac{1}{x}+\log y\right)$

Que.2 Solve $\frac{\partial^2 z}{\partial x \partial y}=\sin x \sin y$, given that $\frac{\partial z}{\partial y}=-2\sin y$, when $x=0$ and $z=0$ when y is an odd multiple of $\frac{\pi}{2}$

Que.3 Solve the following Partial Differential Equation.

(i) $\frac{p}{x^2}+\frac{q}{y^2}=z$

(ii) $(y-z)p+(z-x)q=x-y$

(iii) $z(p-q)=z^2+(x+y)^2$

(iv) $\left(z^2-2yz-y^2\right)p+(xy+zx)q=xy-zx$

(v) $\sqrt{p}+\sqrt{q}=1$

(vi) $z^2\left(p^2+q^2+1\right)=a^2$

(vii) $p^2-q^2=x-y$

(viii) $z=px+qy+p^2q^2$

(xi) $2zx-px^2-2qxy+pq=0$

Que.4 Solve the following Partial Differential Equation.

(i) $r-4s+4t=e^{2x-y}$

(ii) $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial x \partial y}=\sin x \cos 2y$

(iii) $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial x \partial y}-6\frac{\partial^2 z}{\partial y^2}=x+y$

(iv) $\left(D^2-3D'+2\right)^3 z=6e^{2x}\sin(3x+y)$

Que.5 Solve, $2\frac{\partial u}{\partial x}=\frac{\partial u}{\partial t}+u$ subject to the condition $u(x,0)=4e^{-3x}$

Que.6 Solve $\frac{\partial^2 u}{\partial x^2}-4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=0$ using the method of separation of variables.

Que.7 Show that $u=\sin t \sin\left(\frac{1}{4}\right)x$ is a solution of one dimensional wave equation.

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Que.8 A tightly stretched string with fixed end points x=0 and x=L and the displacement $y = y_0 \sin^3\left(\frac{\pi x}{L}\right)$ are initially given. If it is released from this position then find the displacement y, using the equation $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$.

Que.9 A rod 30 cm long has its end A and B kept 20^0c and 80^0c respectively until steady state conditions prevail. The temperature at each end is suddenly reduced to 0^0c and kept so. Find the resulting temperature function u(x,t) from the end A.

Que.10 Solve the equation $u_{xx} + u_{yy} = 0$ subject to the conditions $u(0, y) = u(l, y) = u(x,0) = 0$ and $u(x,a) = \sin\frac{n\pi x}{l}$ for $0 \le x \le l,\ 0 \le y \le a$.

Que.11 Solve following Differential Equations using Frobenius method

1. $x(x-1)y'' + (3x-1)y' + y = 0, at\ x = 0$
2. $x^2y'' + x^3y' + (x^2 - 2)y = 0, at\ x = 0$
3. $4xy'' + 2y' + y = 0, at\ x = 0$

Que.12 Define following special function

1. Gamma function 2. Beta function 3. Direc Delta function
4. Sinusoidal function 5. Error function 6. Rectangle function