Reg.No. ____________

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

		Semester :	**2016-17 ODD**
Code :	**15MA3008**	**Duration :**	**3hrs**
Sub. Name :	**Partial Differential Equations**	**Max. marks :**	**100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Prove that the general solution of the linear Partial Differential Equation $Pp+Qq=R$ can be written in the form $F(u,v)=0$ where F is an arbitrary function and $u(x,y,z)=C_1$ and $v(x,y,z)=C_2$ form a solution of the equation $\dfrac{dx}{P(x,y,z)}=\dfrac{dy}{Q(x,y,z)}=\dfrac{dz}{R(x,y,z)}$.	CO1	10
	b.	Show that the following partial differential equations $xp-yq=x$ and $x^2p+q=xz$ are compatible and hence find their solution.	CO1	10
(OR)				
2.	a.	Find the characteristics of the equation $pq=z$ and determine the integral surface which passes through the straight line $x=1,\ z=y$.	CO1	12
	b.	Derive the Charpit's equations of a first order nonlinear partial differential equation $f\left(x,y,z,p,q\right)=0$.	CO2	8
3.	a.	Reduce the Tricomi equation $u_{xx}+u_{yy}=0,\ x\neq 0$ for all x,y to canonical form.	CO1	20
(OR)				
4.	a.	Derive the canonical form for the second order parabolic partial differential equation.	CO1	10
	b.	Classify and transform the following equation to a canonical form. $\sin^2(x)u_{xx}+\sin(2x)u_{xy}+\cos^2(x)u_{yy}=x$	CO1	10
5.	a.	Derive the solution of the Laplace equation in cylindrical coordinators using variable separable method.	CO3	20
(OR)				
6.	a.	Derive the solution of the two dimensional Laplace equation in Cartesian form using variable seperable method.	CO3	10
	b.	Solve the Dirichlet's problem for a rectangle.	CO3	10
7.	a.	The ends A and B of a rod , 10 cm in length are kept at temperature 0^0C and 100^0C until the steady state condition prevails. Suddenly the temperature at the end A is increased to 20^0C and the end B is decreased to 60^0C . Find the temperature in the rod at time t.	CO3	17
	b.	If $\delta(t)$ is a continuously differentiable Dirac delta function vanishing for large t, then Prove that $\int_{-\infty}^{\infty} f(t)\delta'(t)dt=-f'(0)$.	CO3	3
(OR)				

8.	a.	Derive the solution of Diffusion equation in cylindrical coordinates. Also determine the temperature $T(r,t)$ in the infinite cylinder $0 \le r \le a,$ when the initial temperature is $T(r,0) = f(r)$, and the surface $r = a$ is maintained at 0^0 temperature.	CO3	20
		Compulsory:		
9.	a.	A string of length L is released from rest in the position $y = f(x)$. Show that the total energy of the string is $\frac{\pi^2 T}{4L}\sum_{n=1}^{\infty} n^2 k_n^2$, where $k_n = \frac{2}{L}\int_0^L f(x)\sin\left(\frac{n\pi x}{L}\right)dx$ and T -tension in the string. If the mid-point of a string is pulled aside through a small distance and then released, show that in the subsequent motion the fundamental mode contributes $\frac{8}{\pi^2}$ of the total energy.	CO4	20

ALL THE BEST

CO1 :Cauchy Method of Characteristics,
CO2 : Charpit’s Method,
CO3 : Separation of variables method,
CO4 : Method of Eigen Functions.