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	**:**	**15MA3002**	**Duration**	**:**	**3hrs**
Sub. Name :		**Ordinary Differential Equations**	**Max. marks :**		**100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	State and prove the Existence and Uniqueness Theorem of Linear Differential Equations.	CO1	10
	b.	Define the Fundamental Matrix.And also prove that $(det\Phi)' = (trA)(det\Phi)$.	CO1	10
(OR)				
2.	a.	State and Prove Picards Theorem.	CO2	20
3.	a.	Explain Fixed Point Method.	CO2	10
	b.	Define Contraction Principle and apply this result to establish the Existence and Uniqueness of the solutions of Initial Value Problems.	CO2	10
(OR)				
4.	a.	State and Prove the Existence and Uniqueness Theorem of Non Linear Differential Equations.	CO2	10
	b.	Define Upper and Lower Solution. And also Prove that let $f \epsilon C[[t_0, t_0 + h)XR, R]$ and $\|f(t,x)\| \leq M$. Then there exists a solution of the IVP $x' = f(t,x), x(t_0) = x_0$.	CO2	10
5.	a.	Let $f \in C[IXR, R], v_0, w_0$ be lower and upper solution of $x' = f(t,x), x(t_0) = x_0$ such that $v_0 \leq w_0$ on I=$[t_0, t_0 + h]$. Suppose that $f(t,x) - f(t,y) \geq -M(x-y)$ for $v_0 \leq y \leq x \leq w_0$ and $M \geq 0$. Then there exists monotone sequences $\{v_n\}, \{w_n\}$ such that $v_n \longrightarrow v \; and \; w_n \longrightarrow w \; as \; n \longrightarrow \infty$ uniformly and monotonically on I and that v, w are minimal and maximal solution of IVP.	CO2	20
(OR)				
6.	a.	State and prove Bihari's Inequality.	CO3	10
	b.	Suppose that f(t,x) is non increasing in x then (i)There exists lower and Upper solutions v_0, w_0 of $x' = f(t,x), x(t_0) = x_0$ such that $v_0 \leq w_0$. (ii) there exist a unique solution x of the IVP on I such that $v_0 \leq x \leq w_0$.	CO3	10
7.	a.	Prove that an integral inequality which fuses the Gronewall in equality and the Bihari's Inequality.	CO3	10
	b.	State one Application of Bihari's Integral In equality.	CO3	10
(OR)				
8.	a.	State and Prove Alekseev's Formula.	CO4	10
	b.	Define the following with examples. 1) Linear Homogeneous BVP 2) Linear non Homogeneous BVP	CO4	10

		3)Periodic Boundary Conditions 4) Regular Linear BVP 5) Singular Linear BVP.		
		Compulsory:		
9.	a.	State and Prove Sturm's Comparison Theorem and Sturm;s separation Theorem.	CO4	20

ALL THE BEST