Name: Enrolment No:													
								RGY ST nd Jan 20					
Course: Mathematical Physics Program: M.Sc. Physics Course code: PHYS 7014						Semester: I Time 03 hrs. Max. Marks: 100							
	Each Qu Instruction			•	ks	SECTIC		answer(s	;)				
S. No.	Questi											CO	
Q 1	Find the $(7z)\hat{k}$ is i	e value o irrotation	of <i>a, b</i> ial.	and <i>c</i> su	ich that	$\vec{F} = (3x)$	<i>c</i> − 4 <i>y</i> +	- az)î + (	(cx + 5y)	– 2z)ĵ	$x^{2} + (x - by)$	+ C01	
Q2	Define Unitary matrix with example.								CO1				
Q3	Prove th	Prove that for beta function : $\beta(l, m) = \beta(m, l)$								C01			
Q4	A fair coin is tossed 6 times. Find the probability of getting (a) exactly 2 heads (b) no heads						CO1						
Q5	Find the Laplace transform of $f(t) = t^3 e^{-3t}$ .								CO4				
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Q 6	Solve $\frac{1}{dx}$	$=\frac{1}{x+y}$ to	or x=0.:	5 by usin	g Runga -			with $x_0 =$	$0, y_0 = 1$	L, takınş	g <i>h</i> = 0.5	CO3	
	Or Solve $\frac{d^2y}{dx^2} = x + y$ , with initial condition y(0)=y(1)=0 by forward finite difference method.												
Q 7	The velocity $v$ (Km/min) of a moped which starts from rest, is given at fixed interval of time $t$ (min) as follows												
	t (min)	2	4	6	8	10	12	14	16	18	20		
	v (Km/ min)	10	18	25	29	32	20	11	5	2	0		

Q 8	<ul> <li>(a) Show that the set of natural numbers 1,2,3,4 is not a group with respect to addition.</li> <li>(b) Prove that the set G={1,2,3,4,5,6} is a finite <i>abelian</i> group of order 6 with respect to</li> </ul>					
	(b) Hove that the set $G = \{1, 2, 3, 4, 5, 6\}$ is a finite <i>abelian</i> group of order 6 with respect to multiplication modulo 7.					
Q.9	Evaluate	CO2				
	(a) $\int_0^\infty \sqrt{x} e^{-\sqrt[3]{x}} dx$ (b) $\int_0^\infty \cos x^2 dx$	02				
	Section C					
1. 2.	Each Question carries 20Marks. Instruction: Write long answer.					
Q10	(a) Prove that $J_n(x)$ is the coefficient of $z^n$ in the expansion of $e^{\frac{x}{2}(z-\frac{1}{z})}$ .					
	(b) Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\left(\frac{2}{\pi x}\right)} cosx$	CO4				
	OR					
	(a) Prove that $e^{2xz-z^2}$ is the generating function for <i>Hermite</i> Polynomial.					
	(b) Convert <i>Hermite</i> polynomial					
	$2H_4(x) + 3H_3(x) - H_2(x) + 5H_1(x) + 6H_0$					
	in to ordinary polynomial					
Q.11	(a) Find the matrix P which diagonalize the matrix $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$	CO2				
	(b) Find the residue of $f(z) = \frac{z^2 - 2z}{(z+1)^2(z^2+4)}$					