

Conductors in Conducting Liquid (7 points)

Question	Answer	Marks
1. 0.4 pts	$E =$	
2. 0.4 pts	$f(r) =$	
3. 0.7 pts	$V(x,y,z) =$ Sketch:	
4. 2.0 pts	$V(x,y,z) =$	
5. 0.5 pts	$C =$	
6. 1.0 pts	$I =$	
7. 0.5 pts	$R =$ $RC =$	

Relativistic Correction on GPS Satellite (13 points)

Part A. Single accelerated particle (2.8 points)

Question	Answer	Marks
1. 0.5 pts	$a =$	
2. 0.5 pts	$\beta(t) =$	
3. 0.3 pts	$x(t) =$	
4. 0.7 pts		
5. 0.4 pts	$\beta(\tau) =$	
6. 0.4 pts	$t(\tau) =$	

Part B. Flight Time (2.0 points)

Question	Answer	Marks
1. 1.2 pts	$t_0(\tau) =$ Will it freeze ? Yes or No If yes, $t_0(\tau \rightarrow \infty) =$	
2. 0.8 pts	$\tau_0(t) =$ Will it freeze ? Yes or No If yes, $\tau_0(t \rightarrow \infty) =$	

Question	Answer	Marks
1. 0.3 pts	$\tau_2 =$	
2. 1.0 pts	$C_1 =$	
3. 1.0 pts	$C_2 =$	

Part E. Uniformly Accelerated Frame (2.7 points)

Question	Answer	Marks
1. 0.8 pts	$x_p =$	
2. 1.3 pts	$g_2 =$	
3. 0.6 pts	$\frac{d\tau_2}{d\tau_1} =$	

Part F. Correction for GPS (2.2 pts)

Question	Answer	Marks
1. 0.6 pts	$r =$ (numerical value) $v =$ (numerical value)	
2. 1.2 pts	$\Delta\tau_g =$ (numerical value) $\Delta\tau_s =$ (numerical value) $\Delta\tau =$ (numerical value) Which clock is faster? earth's clock or satellite's clock.	
3. 0.4 pts	$\Delta L =$ (numerical value)	

Physics of Spin (10 points)

Part A. Larmor Precession (1.6 points)

Question	Answer	Marks
1. 0.8 pts		
2. 0.8 pts	$\omega_0 =$	

Part B. Rotating Frame (3.4 points)

Question	Answer	Marks
1. 0.8 pts		
2. 0.4 pts	$\Delta =$	
3. 1.2 pts		
4. 1.0 pts	$\mathbf{B}_{eff} =$ $\overline{\mathbf{B}_{eff}} =$	

Part C. Rabi Oscillation (3.0 points)

Question	Answer	Marks
1. 1.2 pts	$\Omega =$	
2. 0.6 pts	$\alpha =$	
3. 1.2 pts	$P_{\uparrow} = \frac{N_{\uparrow}}{N} =$ $P_{\downarrow} = \frac{N_{\downarrow}}{N} =$	

Part D. Measurement incompatibility (2.0 points)

Question	Answer	Marks
1. 1.0 pts		
2. 1.0 pts		