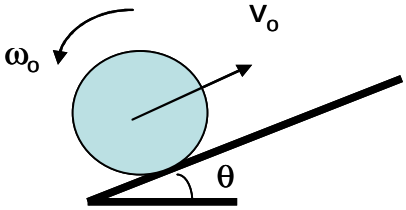
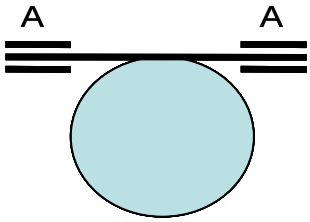
CAIRO UNIVERSITY	Engineering Mechanics II.
Faculty of Engineering	Impulse - Impact Sheet
Eng. Math. and Physics Department	2019-2020
Mining First Year students	

Problem No. (1): A circular disc of (m kg, r m) is thrown so that its center velocity V_o m/sec (upword) and angular velocity ω_o rad/sec(c.c.w) upword an inclined rough plane ($\theta = 30$, $\mu = 0.1$). Choose the correct answers.



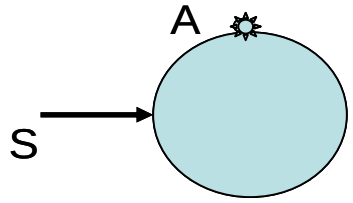
No	Data	m kg	r m	V_o m/sec	ω_o rad/sec
		25	0.4	10	3
	Required	A	B	C	D
1	Polar Moment of Inertia I_G ($kg.m^2$)	7.20	2.00	10.00	2.40
2	T1 just after the disc thrown	2295.00	2170.80	1259.00	3977.60
3	time after which sliding stops t1	1.47	1.74	2.16	2.37
4	The angular velocity of the disc at t1	3.38	2.23	4.52	1.10
5	T2 at t1	34.33	73.64	18.26	53.75
6	the work done by ext. force during t1	-2097	-3924	-2277	-1225
7	distace covered by disc center after t1	16.55	12.00	19.07	8.37

Problem No. (2): A circular disc of (m kg,r m) is suspended from a horizontal axis coinciding with its tangent and hangs with its plane vertical. An impulse S N.sec is struck perpendicular to its plane through the center. Choose the correct answers.



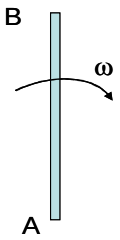
No	Data	m kg	r m	S N.sec	
		25	0.4	50	
	Required	A	B	C	D
1	Polar Moment of Inertia I_A ($kg.m^2$)	40.00	5.00	9.38	18.00
2	The impulse A_x at the axis A-A	20.00	10.00	24.00	16.00
3	The impulse A_y at the axis A-A	100.00	21.53	0.00	151.07
4	w just after the impulse	2.40	4.27	4.00	3.33
5	T just after the impulse	40.000	85.333	115.200	100.000
6	The rotation angle of the disc	64.46	54.31	44.60	53.13
7	S_{min} to cause complete revolution	316.23	150.00	111.80	219.09

Problem No. (3): A circular disc (m=25 kg, r=0.4 m) free to rotate about an axis, through a point on its perimeter, perpendicular to its plane, and a horizontal impulse S=50 N.sec is struck along a diameter of the disc. Choose the correct answers.



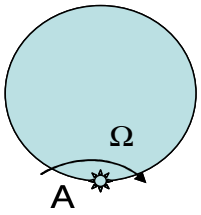
	Data	m kg	r m	S N.sec	
		25	0.4	50	
No	Required	A	B	C	D
1	Polar Moment of Inertia I_A (kg.m^2)	21.60	48.00	6.00	11.25
2	The impulse A_x at the axis A-A	23.33	16.67	26.67	20.00
3	The impulse A_y at the axis A-A	12.53	115.00	0.00	10.05
4	w just after the impulse	1.33	2.67	3.33	1.94
5	T just after the impulse	33.33	40.00	42.67	40.83
6	S_{min} to cause complete revolution	86.60	116.19	244.95	169.71

Problem No. (4): A rod AB (m kg,L m) lying on a smooth horizontal table is set spinning about an axis through its mass-center with angular velocity w_o rad/sec (c.w.). The end A of the rod suddenly becomes fixed so that the rod can turn freely about it. Choose the correct answers.



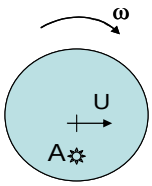
No	Data	m kg	L m	ω_o rad/sec	
		25	2	10	
	Required	A	B	C	D
1	The angular velocity about A	1.50	2.50	1.25	2.00
2	The Impulse at A	75.00	62.50	62.50	78.75
3	The Loss in K.E. of the disc	312.50	312.50	354.38	281.25

Problem No. (5): A disc (m kg, r m), is rotating about its mass-center with angular velocity w_o rad/sec (c.w.), when suddenly a point A on the perimeter becomes fixed. Choose the correct answers.



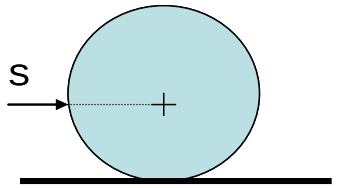
No	Data	m kg	r m	ω_o rad/sec	
		50	0.8	5	
	Required	A	B	C	D
1	The angular velocity about A	2.67	1.67	1.33	2.00
2	The Impulse at A	48.00	66.67	106.67	20.00
3	The Loss in K.E. of the disc	20.00	86.40	133.33	341.33

Problem No. (6): A disc (m kg, r m) is moving in its plane, the velocity of the center is u m/sec to the right, and the angular velocity is w_o rad/sec (c.w.). The points A in the disc at a distance r/2 from the center, in a direction perpendicular to that of u, is suddenly fixed. Choose the correct answers.



No	Data	m kg	r m	U m/sec	ω_o rad/sec
		20	0.4	4	5
	Required	A	B	C	D
1	The angular velocity about A	11.33	6.89	10.00	12.67
2	The Impulse at A	125.00	40.00	102.67	86.67
3	The Loss in K.E. of the disc	225.33	225.87	390.63	60.00

Problem No. (7): A disc (m kg, r m) on a horizontal plane, for which the coefficient of friction is m, receives a horizontal impulse S N.sec through the mass-center. Choose the correct answers.



No	Data	m kg	r m	S N.sec	μ
		30	0.4	150	0.1
	Required	A	B	C	D
1	The center velocity after impact	4.00	3.00	5.00	5.71
1	The angular velocity after impact	2.00	0.00	-2.00	4.00
2	time after which sliding stops t1	1.00	1.67	1.90	1.33
2	The K.E. just after impulse	200.00	375.00	135.00	571.43
3	The K.E. after sliding stops	90.00	380.95	133.33	250.00