



Faculty of Engineering and Technology
Department of Mechanical and Mechatronics Engineering
Second Examination – Fall 2018

ENME 232: Dynamics

Date of Examination: 25/11/2018

Student ID: _____

Time duration: 90 minutes

Total Marks: 100

This exam contains 8 pages (including this cover page) and 3 problems. Check to see if any pages are missing. Enter your Student ID number on the top of this page, and at the bottom of every page, in case the pages become separated.

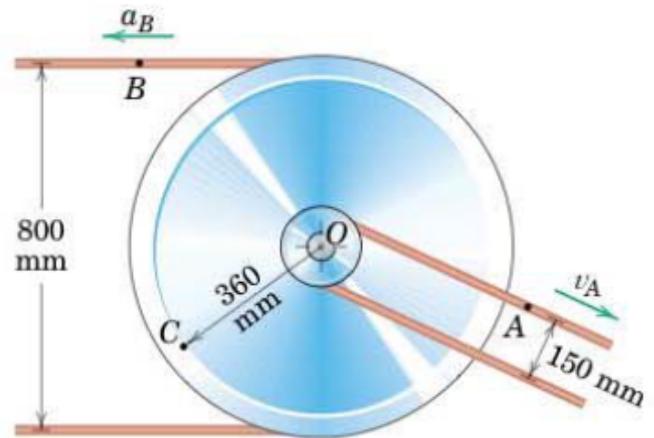
You may *not* use your books, notes, equation sheets, or any other reference on this exam. You can use your own calculator only. Borrowing calculators is not allowed.

You are required to show your work on each problem on this exam.

Do not write in the table below.

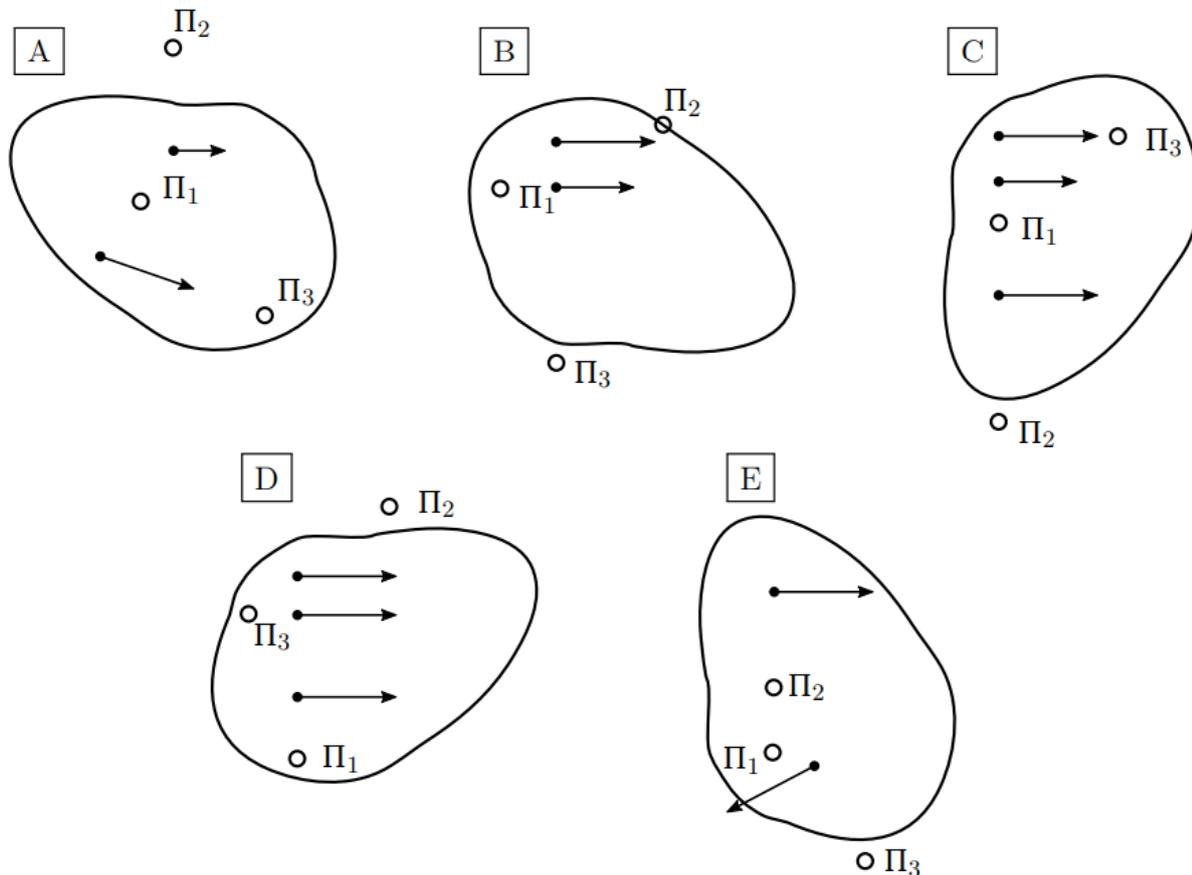
Problem	ABET SO	Points	Score
1	(a)	30	
2	(e)	30	
3	(e)	40	
	Total	100	

1) (a) The two pulleys are fixed together and rotate about the fixed point at O . At a certain instant, point A on the belt of the smaller pulley has a velocity of $v_A = 1.5 \text{ m/s}$, and point B on the belt of the larger pulley has an acceleration of $a_B = 45 \text{ m/s}^2$ as shown. For this instant, determine the magnitudes of the velocity and acceleration of point C .



30 marks

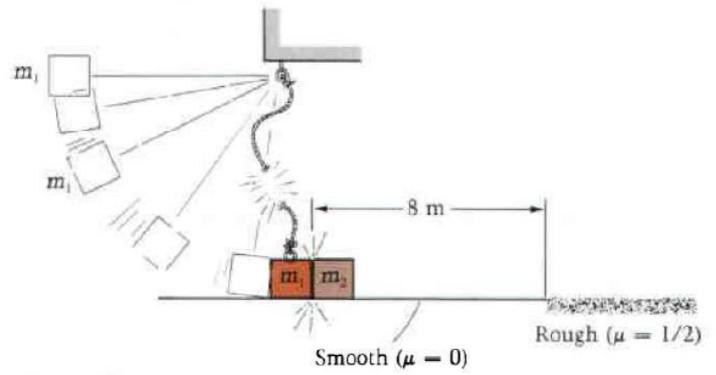
(b) The velocities of certain points on five rigid bodies are expressed by arrows as shown. In each case, locate graphically the instant center of zero velocity and fill your answers in the table below.



Position of IC	A	B	C	D	E
Π_1					
Π_2					
Π_3					
Outside the Figure/ Not Marked					
IC does not exist					

2) A 10 kg block swings down from rest as shown in the figure. When the cord is vertical, the block hits an identical block. Assuming that the 6 m rope breaks during impact and that the two blocks stick together after colliding, how long will it be before they come to rest? How far will they have traveled?

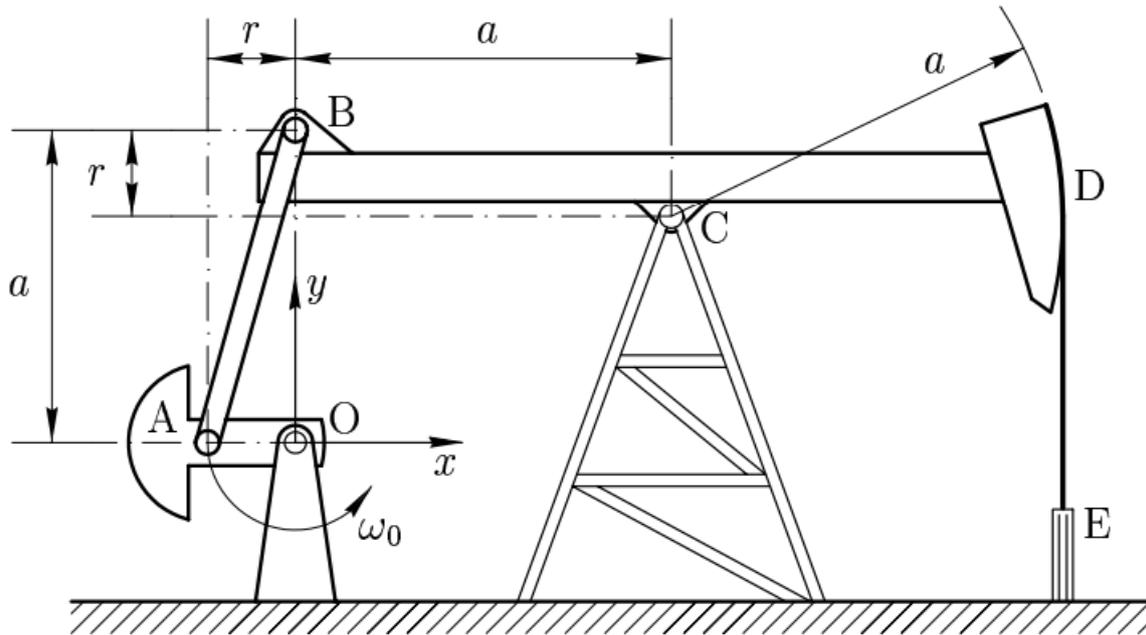
Draw the necessary free body diagram(s) and clearly label your coordinate system(s).



30 marks

3) An oil pump is driven by the crank OA which rotates with a constant angular velocity $\omega_o = 15 \text{ rad/s}$ in the direction shown. The horizontal beam BCD is connected to the crank by the link AB . The pump rod is fixed to point D so that it is always vertically immersed in the hole E . Given that $r = 1 \text{ m}$, $a = 4 \text{ m}$, $\alpha_{CD} = 2 \text{ rad/s}^2$, determine the velocity and acceleration of point E

Note that points B and C are not on the same level.



40 marks

