Tanta University		**Mechatronics Engineering Program**		Faculty of Engineering
Course Title: Dynamics of Mechanical Systems		Course Code: MEP 151		final Exam
Date: **15 – 6 – 2019**	Allowed time: 3 hr. Full Marks: 40			No of Pages: 2

Answer as much as you can *Assume any missing data*

Question:1 (8 Marks)

Determine the velocity of the point B and that of the collar C shown in fig. 1 at the instant when angular velocity of link AB is $\boldsymbol{\omega}_{AB}$= 5 rad/s.
Also find the angular velocity of link BC.

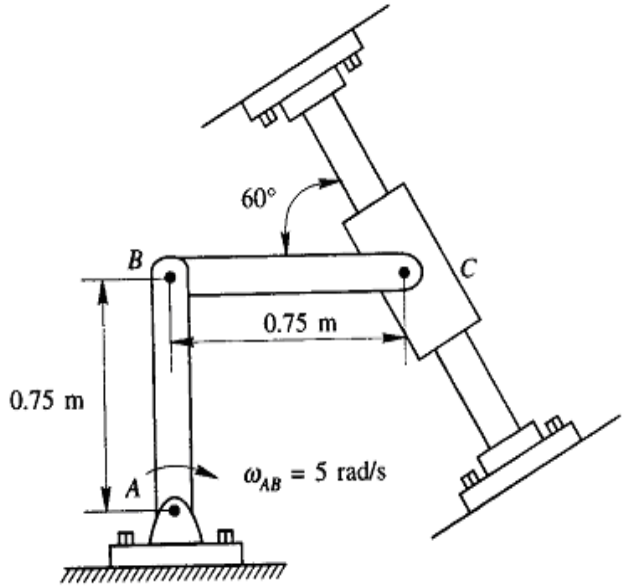

fig.1

Question:2 (8 Marks)

The 1 m long ladder AB shown in fig.2 moves with its ends in contact with a horizontal floor and an inclined plane as shown. At the given instant, end A has a velocity of 1.5 m/s towards left and an acceleration of 0.8 m/s^2 towards right. Determine the velocity and acceleration of end B of the ladder.

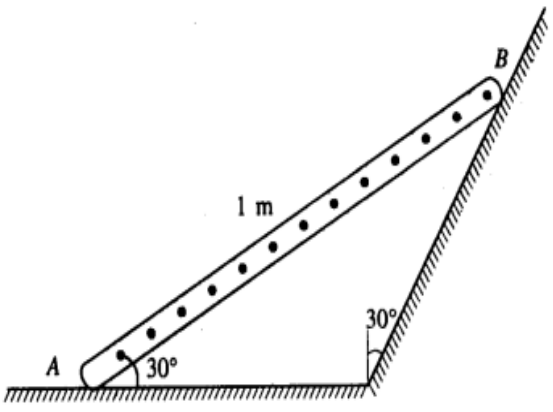

fig.2

Question:3 (8 Marks)

The unbalanced wheel shown in fig.3 has a mass of 15 kg and a radius of gyration of 100 mm. Compute the normal and friction forces acting on the wheel at its point of contact with the horizontal surface, assuming that no slipping occurs.
Note: *the free body and kinetic diagrams must be drawing.*

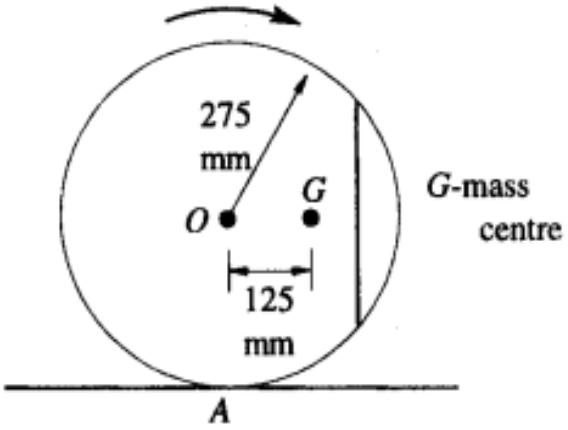

fig.3

Question:4 (8 Marks)

The 15 kg uniform cylinder having 150 mm radius shown in fig.4 is rolled up the 20^O incline with an initial speed of 15 m/s. Determine the maximum distance that the cylinder will roll up the incline. Assume that no slipping occurs.

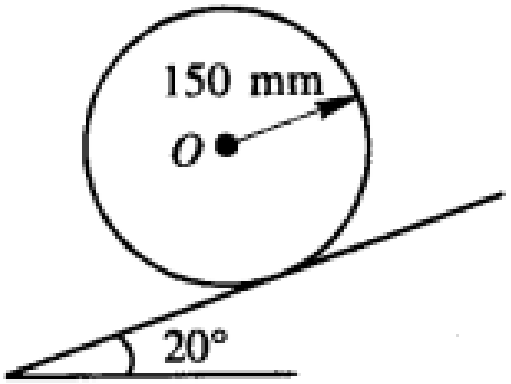

fig.4

Question:5 (8 Marks)

The motor housing and its bracket rotate about the **Z**-axis at the constant rate $\boldsymbol{\Omega}$ = 3 rad/s shown in fig.5. The motor shaft and disk have a constant angular velocity of spin **p** = 8 rad/s with respect to the motor housing in the direction shown. If $\boldsymbol{\gamma}$ is constant at 30^O, determine the velocity and acceleration of point A at the top of the disk and the angular acceleration $\boldsymbol{\alpha}$ of the disk

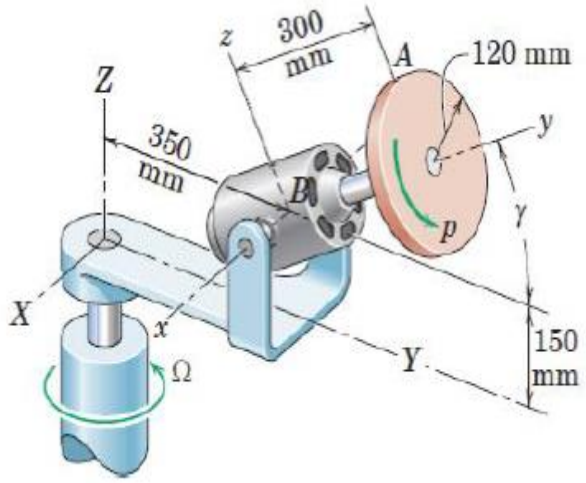

fig.5

Question:6 (8 Marks)

A homogeneous disk of mass m is mounted on an axle OG of negligible mass shown in fig.6. The disk rotates counter-clockwise at the rate w_1 about OG.

Determine:

a) The angular velocity of the disk,
b) Its angular momentum about O,
c) Its kinetic energy, and
d) The vector and couple at G equivalent to the momenta of the particles of the disk.

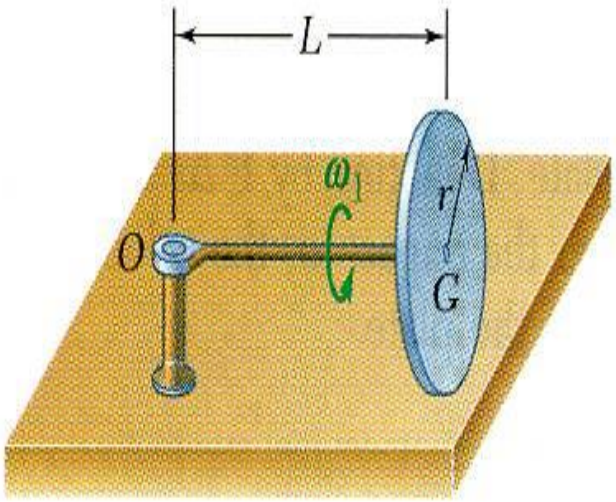

fig.6

***Good luck. ***

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