FINAL ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2021**
Programme	:	Diploma In Mechanical Engineering (DMEN)
Course	:	**EGM1181 : Engineering Dynamics**
Date of Examination	:	27th July 2021 (Tuesday)
Time	:	8:00 am – 10:30 am Reading Time : Nil
Duration	:	2 Hours 30 Minutes

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL** the questions. **Write ALL your answer** in the foolscap papers (you need to prepare your own papers)

Note: 30 minutes is added into the duration of the examination to factor in any connectivity matters and for you to scan and upload your scripts.

Material permitted : Non-Programmable Calculator

Materials provided : **Formula Sheet**

Examiner(s) : **Tham Chan Seng** and Mohammad Faiz

Chief Moderator : Mr Soo Swee Yoong

*This paper consists of **7** printed pages, including the cover page*

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
EGM1181: ENGINEERING DYNAMICS
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer all **FOUR (4)** questions. All questions carry equal marks.

Question 1

(a) The disk is originally rotating at ω_0 = 12 rad/s. If it is subjected to a constant angular subjected to a constant angular acceleration of α =20 rad/s^2, determine the magnitudes of the velocity and the *n* and *t* components of acceleration of point *B* when the disk undergoes 2 revolutions.

(10 marks)

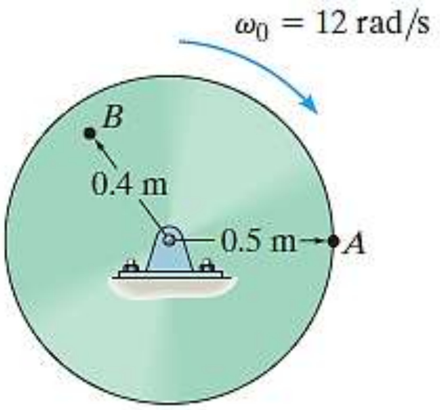

Figure Q1(a)

(b) At the instant θ=60° as shown in Figure Q1(b), the slotted guide rod is moving to the left with an acceleration of 2m/s^2 and a velocity of 5 m/s. Determine

(i) the angular velocity of link AB at this instant. (7 marks)

(ii) the angular acceleration (8 marks)

(Total: 25 marks)

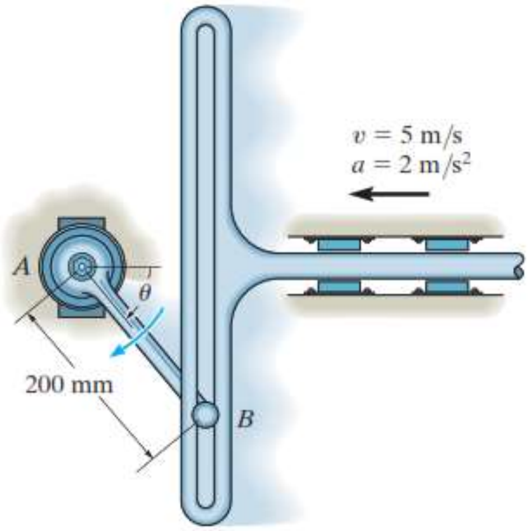

Figure Q1(b)

Question 2

(a) The motor turns the disk with an angular velocity of $\omega=(5t^2+3t)$ rad/s, where *t* is in seconds. When t=3s, determine

(i) the magnitudes of the velocity, (6 marks)

(ii) the *n* and *t* components of acceleration of the point *A* on the disk. (4 marks)

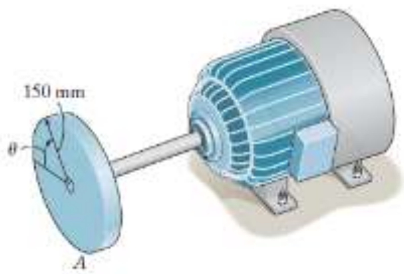

Figure Q2(a)

(b) At the instant shown in Figure Q2(b), θ=60° and rod *AB* is subjected to a deceleration of 16 m/s^2 when the velocity is 10 m/s. Determine the angular velocity and angular acceleration of link *CD* at this instant.

(15 marks)
(Total: 25 marks)

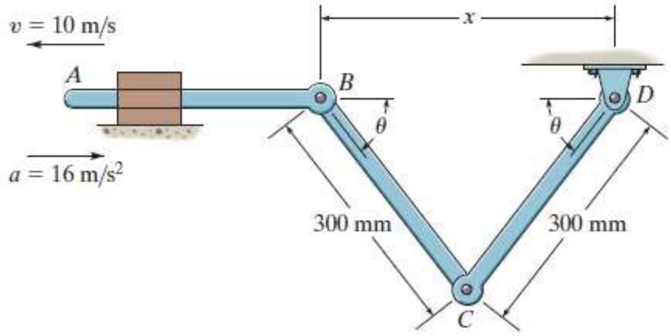

Figure Q2(b)

Question 3

(a) Determine the mass moment of inertia of the thin plate about an axis perpendicular to the page and passing through point *O* as shown in Figure Q3(a). The material has a mass per unit area of 20 kg/m^2.

(10 marks)

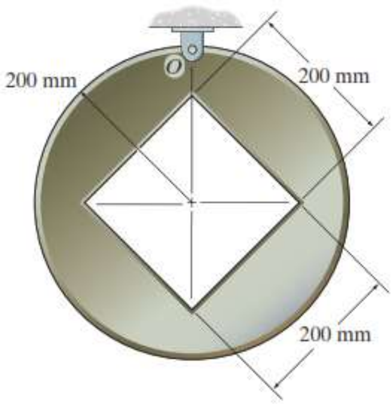

Figure Q3(a)

(b) The trailer with its load has a mass of 150-kg and a center of mass at *G*. If it is subjected to a horizontal force of *P* = 600 N, determine

(i) acceleration of trailer (4 marks)

(ii) the normal force on the pair of wheels at *A* and at *B*. The wheels are free to roll and have negligible mass.

(11 marks)

(Total: 25 marks)

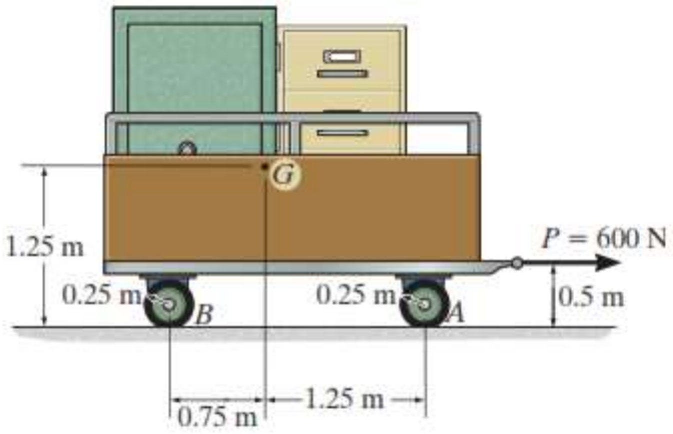

Figure Q3(b)

Question 4

(a) The uniform 24-kg plate is released from rest at the position shown in Figure Q4(a).

Determine

(i) the initial angular acceleration (6 marks)

(ii) the horizontal and vertical reactions at the pin *A*. (6 marks)

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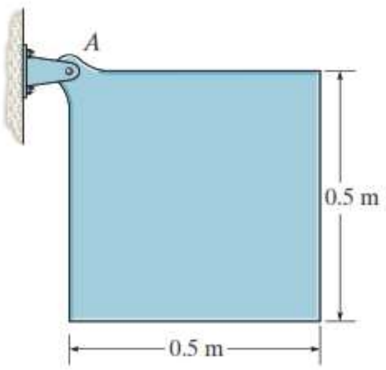

Figure Q4(a)

(b) Figure Q4(b) shows a force of **P** = 60 N applied to the cable, which causes the 200-kg reel to turn since it is resting on the two rollers *A* and *B* of the dispenser. Neglect the mass of the rollers and the mass of the cable. Assume the radius of gyration of the reel about its center axis remains constant at k_O = 0.6 m. Determine the angular velocity of the reel after it has made two revolutions starting from rest.

(13 marks)
(Total: 25 marks)

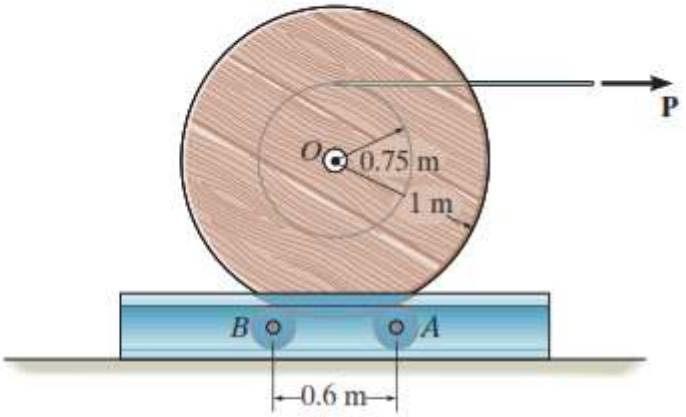

Figure Q4(b)

~The End~

Formula Sheet:

Curvilinear motion:

$a_n = \dfrac{v^2}{\rho}$

$a_t = \dfrac{dv}{dt}$

Polar Coordinate System or r-θ

$v_r = \dot{r} = \dfrac{dr}{dt}$ — v_r =radial component of velocity

$a_r = \ddot{r} - r\left(\dot{\theta}\right)^2$ — a_r =Radial acceleration

$v_\theta = r\dot{\theta} = r\dfrac{d\theta}{dt}$ — v_θ = transverse component

$a_\theta = r\ddot{\theta} + 2\left(\dot{r}\right)\left(\dot{\theta}\right)$ — a_θ = transverse acceleration

Work-Energy Equation:

$$W = \frac{1}{2}m(v^2 - u^2)$$

Work done by spring force

$$W_s = \frac{1}{2}kx^2$$

Impulse-Momentum Equation:

$Ft = mv - mu$

$$\int_{t1}^{t2} F dt = m(v - u)$$

Kinetic Energy (Rotation)

For Disc:

$E_k = \dfrac{1}{2} I_m \omega^2$

$I_m = \dfrac{1}{2} mr^2$

Moment of Inertia

$M = I_m \alpha$

Where M = moment

$V = \omega r$

$a = \alpha r$

Radius of Curvature $\rho = \dfrac{\left[1 + \left(\dfrac{dy}{dx}\right)^2\right]^{3/2}}{\left|\dfrac{d^2y}{dx^2}\right|}$

-The End –