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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FMD12103**
SUBJECT TITLE	:	**STATICS AND DYNAMICS**
LEVEL	:	**DIPLOMA**
TIME / DURATION	:	**8.00 PM – 10.30 PM (2.5 HOURS)**
DATE	:	**30 DECEMBER 2014**

INSTRUCTIONS TO CANDIDATES

1. **Please read the instructions given in the question paper CAREFULLY.**
2. **This question paper is printed on both sides of the paper.**
3. **Please write your answers on the answer booklet provided.**
4. **Answer should be written in blue or black ink except for sketching, graphic and illustration.**
5. **This question paper consists of TWO (2) sections. Section A and B. Answer ALL questions in Section A. For Section B, answer TWO (2) questions only.**
6. **Answer all questions in English.**

THERE ARE 5 PAGES OF QUESTIONS AND 2 PAGE OF APPENDICES, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

The radius of a sphere is measured to be *7.9 cm*, and its mass is measured to be *1.65 kg*. The sphere is solid. Determine its ***density in kilograms per cubic meter*** and ***the relative density***.

(10 marks)

Question 2

In *Figure 1*, determine ***the magnitude of the resultant force*** acting on the bracket.

(10 marks)

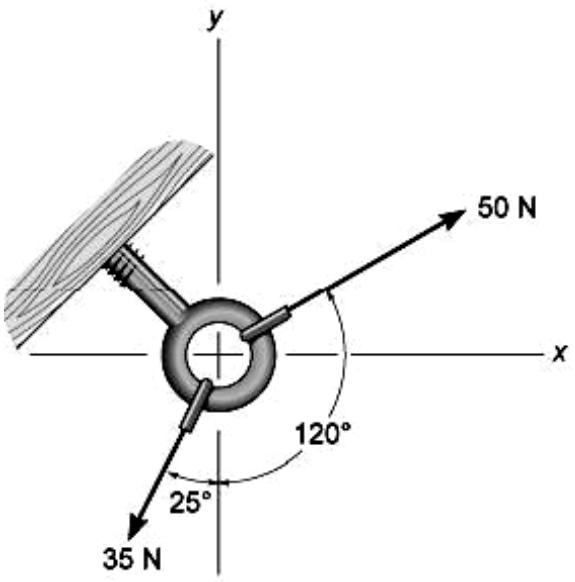

Figure 1

Question 3

Determine ***the tension in chain AC*** and ***weight of the box*** so that the particle is in equilibrium as shown in *Figure 2*. The tension in chain *AB* is *300 N*.

(10 marks)

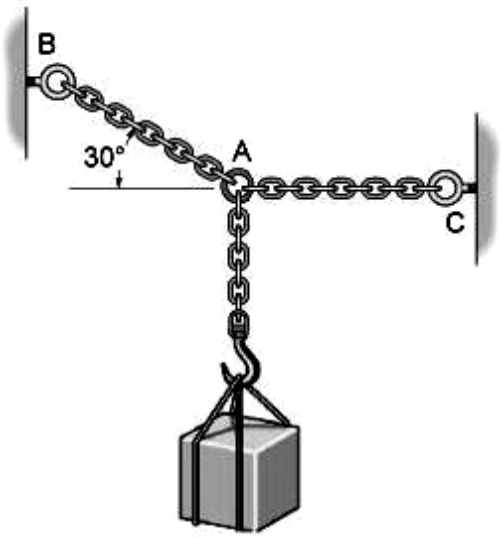

Figure 2

Question 4

Determine ***the resultant moment about the bolt located at A*** as shown in *Figure 3* below.

(10 marks)

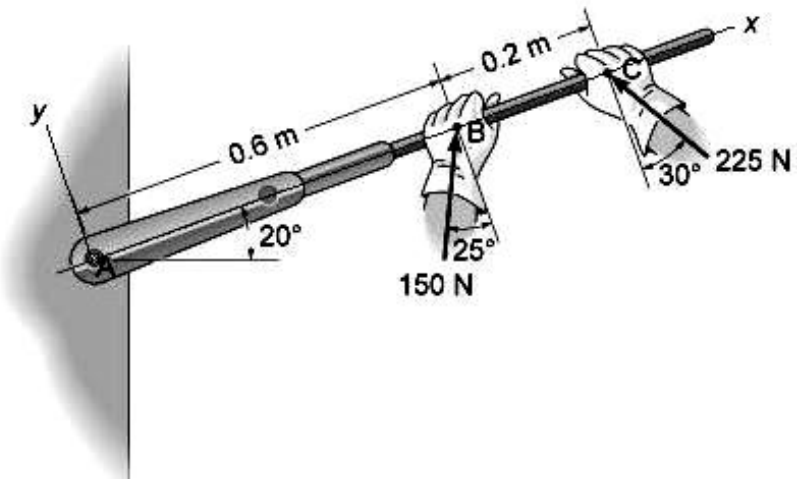

Figure 3

Question 5

An electric motor starting from *500 rpm* to reach speed of *1440 rpm* for *20 seconds*. Calculate ***the angular acceleration*** and ***the angular displacement*** made by the motor during this period.

(10 marks)

Question 6

A box of mass *110 kg* is sliding down of an inclined plane, which makes an angle of *35*° to the horizontal. If the coefficient of kinetic friction is *0.43*, calculate ***the acceleration of the box***.

(10 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 7

Compute ***the coordinates of the centroid*** of the thin plate as shown in *Figure 4.*

(20 marks)

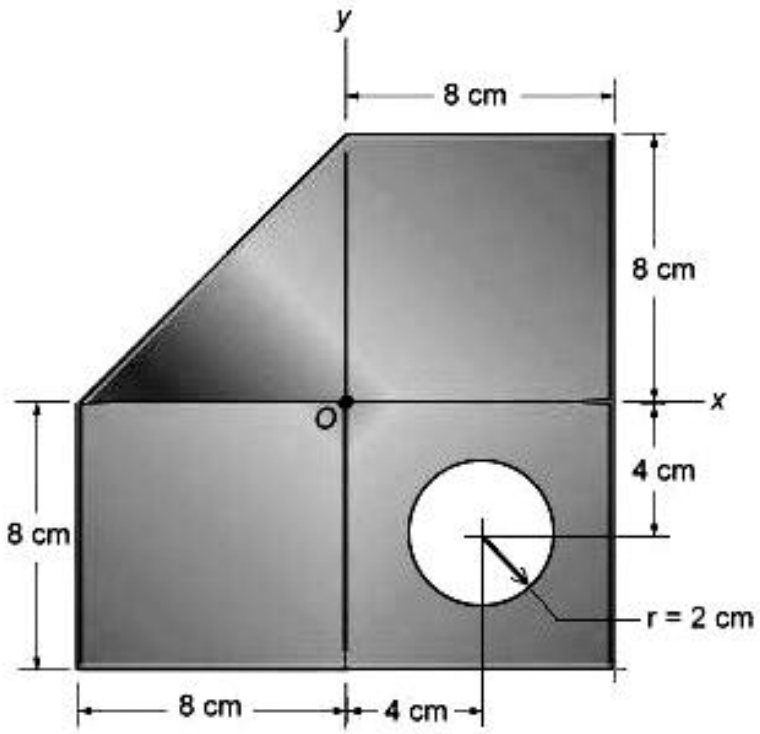

Figure 4

Question 8

The boy in *Figure 5* throws the ball horizontally at point *A*. Determine:

(a) ***the time of flight t_{AB}***,

(4 marks)

(b) ***the initial velocity V_A***,

(4 marks)

(c) ***the final velocity at B*** and ***it direction***.

(12 marks)

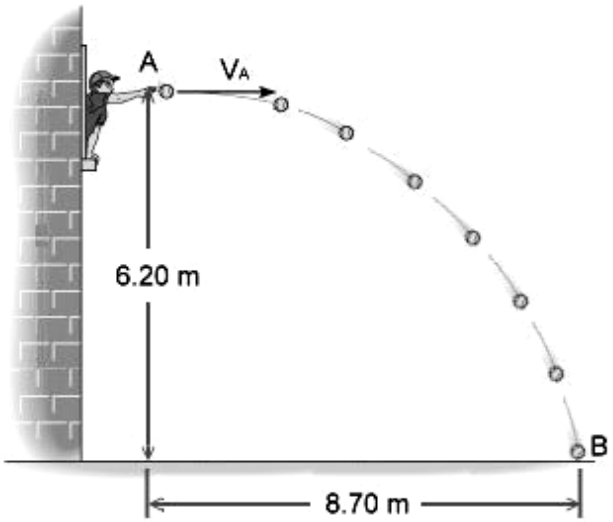

Figure 5

Question 9

In *Figure 6*, the block of weight of *500 N* slides down the inclined plane for which the coefficient of friction is *0.25*. If it is moving at speed *V* when it reaches point *A*, determine ***the maximum deformation of the spring*** needed to momentarily arrest the motion.

(20 marks)

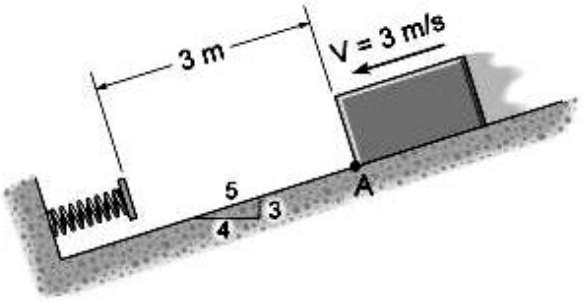

Figure 6

END OF QUESTION

APPENDICES: FORMULAE AND TABLES

Linear Motion	Angular Motion
$S = V_0 t + \frac{1}{2} a t^2$	$\theta = \omega_0 t + \frac{1}{2} \alpha t^2$
$V = V_0 + a t$	$\omega = \omega_0 + \alpha t$
$2 a S = V^2 - V_0^2$	$2 \alpha \theta = \omega^2 - \omega_0^2$

Relationship between Linear Motion and Angular Motion:	
$S = r \theta$	$r_A \theta_A = r_B \theta_B$
$V = r \omega$	$r_A \omega_A = r_B \omega_B$
$a = r \alpha$	$r_A \alpha_A = r_B \alpha_B$

Kinetic of a Particles:

Newton's 2nd law of motion, $\Sigma F = m a$

Frictional force, $F_f = \mu F_n$

Weight, $W = m g$

$a = V^2 / r$, $a = \omega^2 . r$

Torque, $T = F r$, $T = I \alpha$

(*Solid cylinder*) Mass moment of inertia, $I = \frac{1}{2} m r^2$

Work done by a force, $U = F S$

Work done against gravity, $U = m g h$

Work done by a torque, $U = T \theta$

Power, $P = U / t$, $P = F V$, $P = T \omega$

Efficiency, $\varepsilon = P_{output} / P_{input}$

Kinetic Energy (*Linear*), $KE = \frac{1}{2} m V^2$

Kinetic Energy (*Angular*), $KE = \frac{1}{2} I \omega^2$

Potential Energy, $PE = m g h$

Strain Energy, $SE = \frac{1}{2} k x^2$

Center of Gravity and Centroid:

$\bar{x} = \frac{\sum A\tilde{x}}{\sum A}$	$\bar{y} = \frac{\sum A\tilde{y}}{\sum A}$

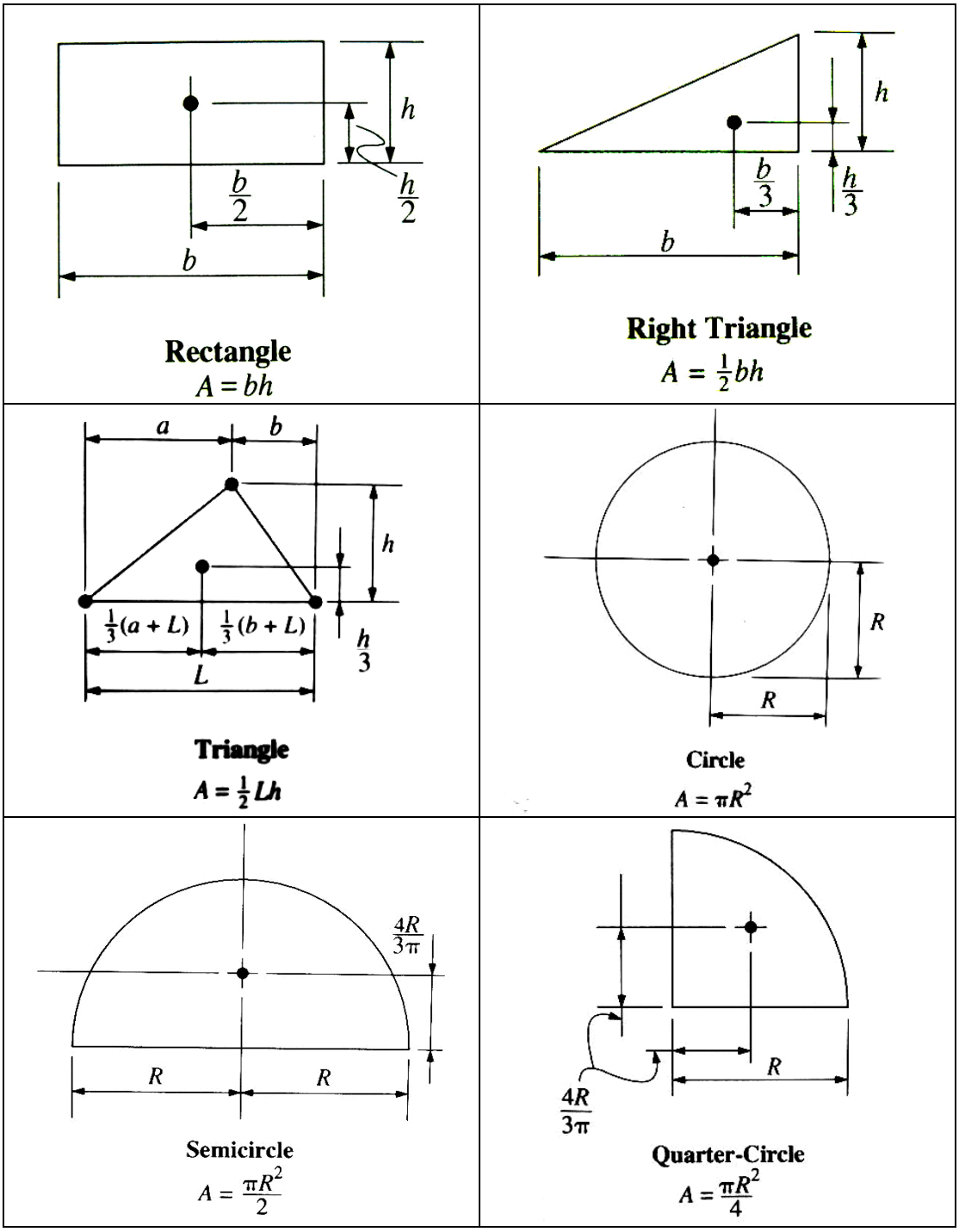

Table 1: Properties of some common plane areas and centroid of areas.