UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT:	**PURE AND APPLIED MATHEMATICS**
MODULE:	**APM2EA1** (Old code: APM1A2E) INTRODUCTION TO STATICS - EXTENDED
CAMPUS:	**AUCKLAND PARK KINGSWAY**

FINAL EXAMINATION

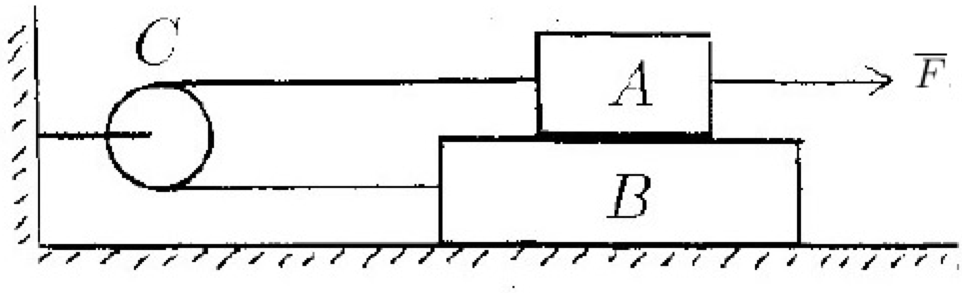
DATE: 06/06/2017	**SESSION: 12H30 – 15H30**
ASSESSOR:	**MR JM HOMANN**
MODERATOR:	**DR GJ KEMP**
DURATION: 2 HOURS	**MARKS: 50**

Instructions and remarks:

1. This question paper consists of 2 pages, excluding this one.
2. Vectors are indicated throughout by the bar notation. For example, $\overline{F}$.
3. You will be penalised if you fail to distinguish between vectors and scalars by means of notation.
4. You will be penalised if you do not use the same notation as described in each question.
5. The use of pocket calculators is permitted. Only use your calculator for the final answer. No marks will be awarded for using rounded off answers in intermediate steps and no marks will be awarded for an incorrect final answer due to rounding errors during calculations.
6. You may answer the questions in any order, however you must clearly indicate the question number. Furthermore, rule off after each question.
7. If you answer a particular question more than once, then clearly indicate which one is to be marked by means of neatly scratching out the answers which are not to be marked. If you fail to indicate which answer should be marked, then the marker will choose exactly one of the questions to mark, without complaint from the test taker.

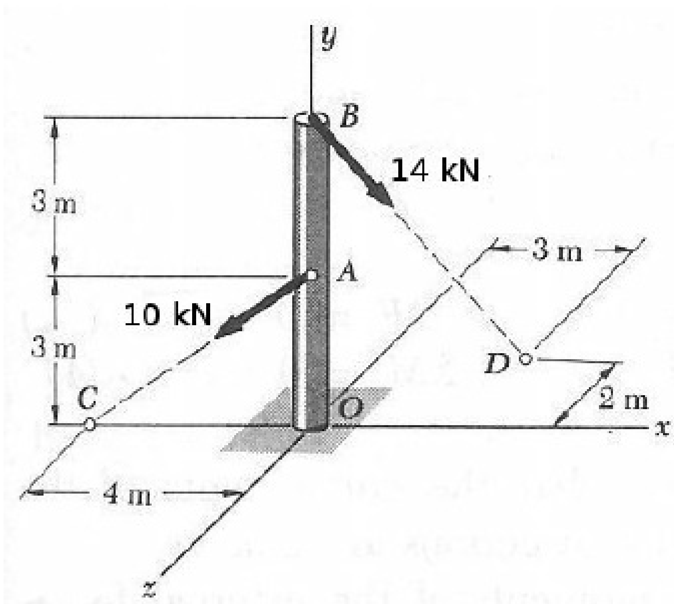
QUESTION 1 [10 MARKS]

The weight of blocks A and B are W and $4W$, respectively. The rope that links the two blocks goes over a smooth pulley at C. If the coefficient of friction between all the surfaces is $\frac{1}{2}$, calculate the magnitude of force $\overline{F}$ (as a multiple of W), necessary to make block A just move to the right.



QUESTION 2 [9 MARKS]

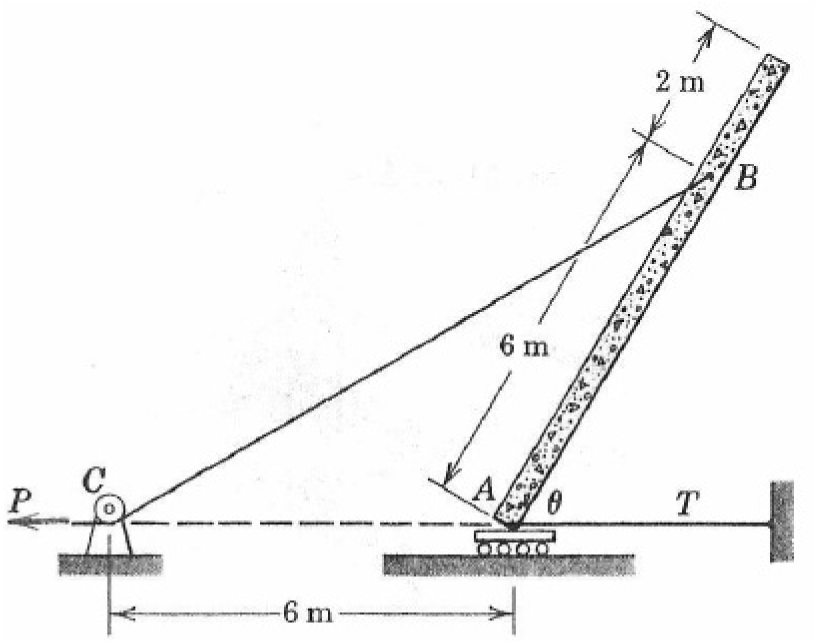
With reference to the following figure, two forces are applied to the vertical pole as shown. Determine an equivalent system consisting of a force at O and a couple.



QUESTION 3 [11 MARKS]

With reference to the following figure, the uniform concrete beam (weight W), is lowered slowly with the help of two cables which are respectively fixed to the cable at A and B. Each of the cables can yield a maximum tensile force of $4W$.

1. Will the cables resist the weight and, if not, which one will break first?
2. If a cable breaks, for which value of θ will this happen?



QUESTION 4 [20 MARKS]

With reference to the following figure, the 10 m pole is acted upon by a 4.2 kN force. It is supported by a ball and socket at A and by the two cables, BD and BE. Neglecting the weight of the pole, determine the tension in each cable and the magnitude of the reaction at A. Let the tension in cable BD be T_1 and let the tension in cable BE be T_2.