UNIVERSITY OF MALTA

THE MATRICULATION EXAMINATION

INTERMEDIATE LEVEL

APPLIED MATHEMATICS

May 2017

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION

CERTIFICATE EXAMINATIONS BOARD

Applied Mathematics

Intermediate Level

May 2017

Part 1: Statistical Information

The distributions of grades awarded in the May 2017 session are given in the table below.

GRADE	A	B	C	D	E	F	abs	TOTAL
NUMBER	5	6	9	3	4	6	1	34
% OF TOTAL	14.7	17.6	26.5	8.8	11.8	17.6	2.9	100

Part 2: Comments regarding candidate's performance

Question 1:

This problem was well attempted by the majority of the candidates although some candidates encountered some difficulties when trying to obtain the velocities of the spheres after their second collision.

Question 2:

The sketch of the framework in equilibrium was not drawn correctly in a number of cases. This led to incorrect results.

Question 3:

Part (i) of this problem was attempted correctly by the majority of the candidates. The second part of the problem was done correctly only by a few candidates.

Question 4:

The first part of this problem was answered correctly by most candidates. The coordinates of the point where the line of action of the resultant intersect with the x-axis were obtained correctly by only few candidates. As a result of this, the equation required in the remaining part of the problem was correctly obtained by very few candidates.

Question 5:

Parts (i) and (iv) of this problem were attempted correctly by most candidates. The other two parts were answered properly by the candidates who had worked part (i) correctly.

Question 6

Generally the question was answered correctly. However, some comments are worth noting: the lack of SI units to describe the forces; in part (ii), few candidates did not appreciate that the frictional force was acting up the slope.

Question 7

On the whole the question was answered well. However some failed to recall the equations $T = \frac{\lambda x}{l}$ and $EPE = \frac{\lambda x^2}{2l}$. For (iv), the requirement is that *EPE* + *GPE* + *KE* = constant, between positons B and C. Common mistakes were that many omitted *EPE*, used an incorrect position of datum or found the velocity instead of the KE_B.

Question 8

The question involves a car driving around an inclined track. It is a standard simple problem involving fricton, reaction, weight and force directed towards the centre. Very few candidates answered this question correctly. The forces should have been resolved vertically and horizontally, parallel to the centripetal force (horizontally) and weight (vertically). Common mistakes were incorrect resolution of the forces and not including all the necessary forces. Although sin 45 = cos 45, the candidates should be able to employ the correct trigonometric function according to the location of the angle. Many had difficulty solving the resulting algebriac equation to obtain the correct solution.

Question 9

The question involves 3 cylinders sitting in a gutter in equilibrium creating a symmetrical system along the vertical axis. Many candidates found this question to be challenging. The geometry dictates that the triangle joining the three centres of the cylinder produce an equilateral triangle, resulting in equal internal angles of 60^o. In general nearly all candidates obtained this angle. In part (i), the normal reaction is found by considering the whole system and resolving vertically. More than half the number of candidates answered this part correctly. The remaining candidates basically did not have the knowledge to successfully proceed further. For part (ii), the reaction between A and C needs to consider either the equilibrium of cylinder A or of cylinder C, and resolve the forces vertically in either case. Some did not resolve the forces correctly and consquently gave incorrect answers. In part (iii), the equilibrium of cylinder A needs to be considered and resolving in the horizontal direction immediately gives the result of the reaction between A and the side of the gutter. Candidates who correctly answered parts (i) and (ii) answered (iii) correctly.

Question 10

The question involves a particle, with an initial velocity, travelling in a straight line under constant retardation to finally arrive to a positon of rest. The question could have been answered either graphically or using the equations of motion. Candidates who adopted the graphical method plotted the velocity-time graph correctly and used the knowledge that the negative slope is the retardation and that the area under the graph is the distance travelled. Virtually all the candidates who used the graphical solution were successful. However, many of those candidates who opted to solve the question using the equations of motion, were not successful. The main errors arose due to incorrect algebraic manipulation and mixing of the symbols, especially for the velocities at the points O, A, B and C. An excessive lack of usage of SI units for distance, velocity and acceleration was noted.

Chairperson

2017 Examination Panel