



**L-Università
ta' Malta**

**MATSEC
Examinations Board**



Examiners' Report

INTERMEDIATE APPLIED MATHEMATICS

First Session 2024

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for Intermediate Applied Mathematics was **30**, which is **1** candidate less than in 2023.

Table 1 shows the distribution of grades for the Main 2024 Session of the examination

GRADE	A	B	C	D	E	F	ABS	TOTAL
NUMBER	7	5	0	0	0	4	14	30
% OF TOTAL	23.3	16.7	0.0	0.0	0.0	13.3	46.7	100

Table 1: Distribution of grades for Intermediate Applied Mathematics, First Session 2024

B. GENERAL REMARKS

In general, the candidates' performance in this examination was as expected, the answers to the questions showed the full spectrum range of knowledge and problem-solving skills. Performance indicated that some candidates were very well prepared whilst others performed poorly.

C. COMMENTS ON PAPER*Question 1.*

Most of the candidates showed good understanding of the Cartesian system, on how to resolve into components and how to apply the principle of moments to find where the line of action of the resultant crosses the x axis. Some candidates found the magnitude and angle of the resultant although the question didn't ask for such information. Responses indicated difficulty in solving part (c), but the use of the principle of moments was evident.

Question 2.

Most of the candidates understood the question, resolved the forces correctly and applied Newton's second law of motion to find the acceleration of the mass. The candidates also showed good understanding of how to evaluate the friction and how it affects the resulting acceleration.

Question 3.

A number of candidates did not include the reaction at A in the FBD. Responses indicated that some may have assumed that the reaction is either parallel or perpendicular with the rod, whilst a few applied the force B at A. Excluding the issues related to the reaction at A, the majority solved for the force P by taking moments at A. The solutions for the reaction at A varied since a few candidates assumed the wrong direction of the reaction.

Question 4.

Most of the candidates understood the question and answered correctly. A minor mistake included omitting the mass of the plate but the method was correct.

Question 5.

Almost all the candidates showed a good grasp of the equations of motion and overall, the average mark for this question is very high.

Question 6.

The question was generally answered well by most candidates. A few drew the set up incorrectly with one of the masses on a horizontal table and another passing over a pulley over the edge. No smooth table is mentioned in the question, only "a smooth fixed pulley". The candidates had to apply Newton's second law to both sides of the pulley with the 7 kg mass accelerating downwards and the 4 kg mass moving up with the same acceleration in a vertical plane. The tension in the string on both sides are the same. The resulting simultaneous equation had to be solved for the acceleration and tension. A few candidates had algebraic mistakes when solving these two equations.

Question 7.

There were mixed level responses. Initially the solution required resolving perpendicular to the plane to find the reaction forces and hence the frictional force acting down the plane. The question had two alternative methods of solution; a) using the conservation of energy where the total initial energy $(KE + PE)_{\text{initial}} = \text{total final energy } (KE + PE)_{\text{final}} + \text{work done against friction}$. A common error using this method was that the work done against friction was subtracted from total final energy $(KE + PE)_{\text{final}}$; b) using Newton's second law to find the deceleration and using the equations of motion to find the time to stop and distance travelled depending on which equation was used. More candidates preferred method b).

Question 8.

The question was fairly well understood and attempted. The speed before impact and after impact could have been found by two methods; a) using the equations of motion under the action of gravity, and b) using the conservation of energy in two stages, before and after impact with the ground, to find the coefficient of restitution. The two main sources of error were not calculating the speed after impact on rebound and applying the coefficient of restitution correctly.

Question 9.

The conical pendulum problem was well understood by most. Using equilibrium in the vertical direction to find the tension in the string, followed by Newton's 2nd law in the horizontal direction to find the angular speed. The three sources of errors were not correctly finding the apex angle of the conical pendulum, incorrectly applying Newton's law and the algebraic solutions.

Question 10.

The question involved a simple projectile moving under gravity landing on the same horizontal ground. The candidates had to prove that $u = 15$ and the highest point reached is 11.25 m above the ground. In part a) the candidates could find u either by using the distance travelled in the x - and y -directions (s_x and s_y respectively) at the impact point and find the value of u ; otherwise assuming the value of $u = 15$ and confirm that the total horizontal distance travelled is 90 m. In part b) finding the highest point was then easily found by most especially being already given that $u = 15$; either using the notion that highest point and finding the time to reach the point; or having found the total time of flight from part a), simply dividing by two due to the given projectile flight problem. In the final part c) a number of candidates only found the vertical speed, whilst the question asked to find the speed of the projectile at time of 2.5 s after being hit. vertical velocity, v_y is zero at the

D. CONCLUDING COMMENTS

In general, the overall performance of the candidates was good. However, it is worth noting that for a few the fundamental mathematical skills of algebraic solution and method to solve such problems need improvement. Also, generally the presentation of the solutions needs major development, proper annotation of what is happening and clear indication of the final answer to the solution. It is important that candidates prepare themselves and consolidate their knowledge. It is worth noting that there were a good number of candidates who were knowledgeable in the topic and well prepared.

Chairperson
Examination Panel 2024