MENGO SENIOR SCHOOL

MIDTERM 1 EXAMINATIONS 2014

ADDITIONAL MAHEMATICS

PAPER 2

TIME: $2\frac{1}{2}$ HOURS

INSTRUCTIONS TO CANDIDATES:

- Attempt all questions in this paper
- All questions carry equal marks
- Mathematical tables and silent non-programmable scientific calculator may be used.

SECTION A

1. A body of mass **m**kg lies on a rough plane inclined at $\boldsymbol{\theta}°$ to the horizontal.

   When a force of $\frac{\boldsymbol{mg}}{\mathbf{2}}$N parallel to and up the plane is applied to the body, it is just about to move up the plane. When a force of $\frac{\boldsymbol{mg}}{\mathbf{4}}$**N** parallel to and down the plane is applied to the body, it is just about to move down the plane.

   Calculate to **2** decimal places the value of

   (i) $\boldsymbol{\theta}$

   (ii) the coefficient of friction between the body and the plane. **(12 marks)**

2. (a) Two particles of masses 5kg and 3kg initially moving in opposite directions with speeds $4ms^{-1}\ and\ 2ms^{-1}$ respectively collided and coalesced on impact.

Find the velocity of the 5kg mass immediately after collision. **(04 marks)**

(b) Two bodies A and B have masses of 3kg and respectively. When A is moving with velocity of (5**i**−**6j**) ms^{-1}, it collides with B whose velocity is (2**i**+3**j**) ms^{-1}.Immediately after collision the velocity of B is (5**i**) ms^{-1}.

Find the:

(i) Velocity of A after collision

(ii) loss in kinetic energy of the system due to collision. **(08 marks)**

3. (a) P, Q and R are three points in that order lying on straight line. A particle travelling along the straight line with constant acceleration, passes P with velocity $\boldsymbol{u}ms^{-1}$.It covers the first 200m form P to Q and the next 500m from Q to R in equal time intervals of 5second each.

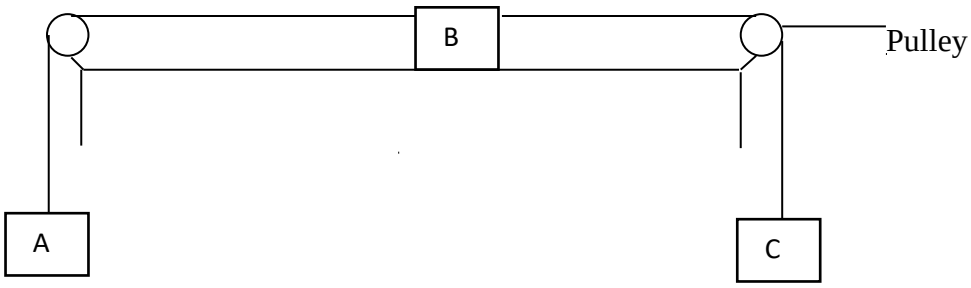
Find the value of:

(i) The constant acceleration

(ii) **u** (07 marks)

(b) Sketch a velocity-time graph for the motion of the particle. (05 marks)

4.



The diagram above shows particles A, B and C of masses 3,4 and 6kg respectively connected by light inextensible strings which pass over smooth pulleys at the edges of the table. Particle B rests on a horizontal rough table, coefficient of friction between the table and mass B being 0.5.The system is released from rest.

(i) Calculate the acceleration of the masses

(ii) Find the tension in each string.

(iii) After C has dropped through a distance of 2m, the string connecting it to mass B snaps (breaks). Determine the time and velocity at which it occurs.

5. The table below shows the marks obtained by additional math candidates in a certain Exam.

$Marks$	$Cumulative\ frequency$
$0-<10$	1
$10-<20$	4
$20-<30$	12
$30-<40$	18
$40-<50$	28
$50-<60$	40
$60-<70$	50
$70-<80$	54
$80-<90$	56
$90-<100$	57

(a) Draw a histogram and use it to estimate the modal mark.

(b) Calculate the :

(i) Mean mark

(ii) Range of the middle 50% of the candidates

6. A continuous random variable , X, is such that $X \in \boldsymbol{R}[2,8]$

(a) Write down the expression for the p.d.f of x and sketch it's graph.

(b) From your p.d.f above, find the:

(i) E(X)

(ii) Var(X)

(iii) $P(X < 7/4 \leq X < 8)$

7. (a) A discrete random variable X has a probability distribution given below.

X	1	2	3	4	5
P(X=x)	k	2k	3k	4k	5k

(i) Determine the value of k

(ii) Find the $P(2 < X \leq 4)$

(iii) Calculate the mean and standard deviation of X

(b) A balanced die has faces labeled 1, 2,... ,6. The die is tossed 8 times. Let A be the event $\{an\ odd\ number\ shows\ up\}$

(i) Find P(A)

(ii) Determine the probability that the event A occurs more than once (12 marks)

8. (a) In a game, a fair die and a fair coin are tossed once at the same time. A die scores when a six appears on the upper face and a coin scores when a head appears.

If a player tossed the once, what is the probability of getting:

(i) Exactly one score

(ii) At least one score

(b) Events A and B are independent where $P(AuB)' = \frac{1}{4}$ and $P(AnB) = \frac{1}{4}$.

Find the :

(i) P(A)

(ii) P(B)

GOOD LUCK(math dept mss)