TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE

ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2207 : ENGINEERING MECHANICS (DYNAMICS)

SPECIAL SUPPLEMENTARY EXAMINATION

SERIES: SEPT. 2017

TIME: 2 HOURS

DATE: Pick Date Sep 2017

Instructions to Candidates
You should have the following for this examination
    -*Answer Booklet, examination pass and student ID*
This paper consists of five questions. Attempt any THREE questions.
Do not write on the question paper.

QUESTION ONE

A projectile is launched with speed ϑ_o from point A, FigureQ1.Determine the launch angle θ , which results in the maximum range ,R up the incline of angle α where $0^0 \leq \alpha \leq 90^0$.

Evaluate your results for $\alpha = 0^0$, 30^0 , 45^0 .   (20 marks)

QUESTION TWO

A pile driver hammer of mass 0.6 tonne falls 2.4 m from rest on to a pile of mass 100 kg. There is no rebound and the pile is driven 200 mm into the ground. Calculate

    a) The common velocity after impact

    b) The average resisting force of the ground in bringing the pile and driver to rest.

                                                                (20 marks)

 QUESTION THREE

a) Two cars collide at right angles in the intersection of two icy roads. Car A has a mass of 1200kg and car B has mass 1600 kg. The cars become entangled and move off in the direction indicated figureQ3.If car A was travelling at 50 km/h at the instant of impact, compute the corresponding speed of B just before impact.   (13 marks)

b)An aircraft travelling due west at 600 km/h just passes over another aircraft travelling due north at the same speed. What is the velocity and direction of the first aircraft relative to the second?   (7 marks)
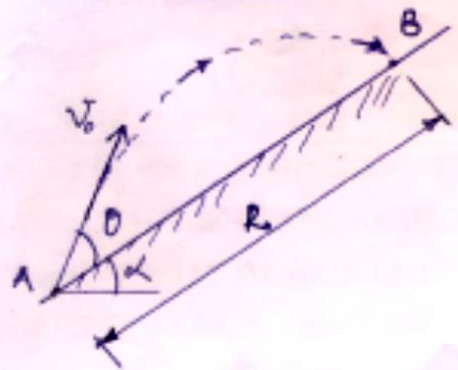
QUESTION FOUR

Two ships are steadily steaming towards each other. When 1000 m apart ship B takes avoiding action and turns through 30^0 to port. The speed of ship A is 20m/s and that of ship B is 30m/s. Calculate their nearest distance apart and how long this distance is reached after B takes avoiding action. Neglect the time taken to alter the course.   (20 marks)
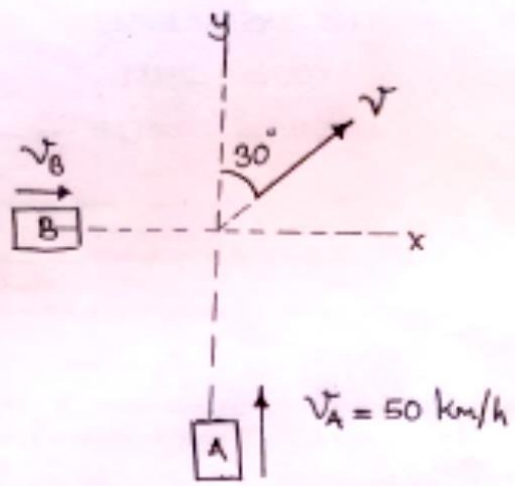
QUESTION FIVE

a) At any instance the horizontal position of a weather balloon is described by $X = 8t$ m, where t is in seconds. If the equation of the path is $y = X^2/10$ determine the magnitude and direction of velocity and acceleration when $t = 2$ sec.

(20 marks)

Fig Q1

Fig Q3

$V_A = 50 \text{ km/h}$

Fig Q5

$y = x^2/10$

Baloon

weather station.