UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2009/2010

SUBJECT	:	PHYSICS 1
CODE	:	DSF 1963
COURSE	:	1DEE / DET / DDM / DDX
DATE	:	APRIL / MAY 2010
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER ALL QUESTIONS IN **PART A** AND **THREE (3)** QUESTIONS IN **PART B**

THIS EXAMINATION PAPER CONSISTS OF 8 PAGES

PART A

Q1 (a) Work is done on an object when a force moved the object at certain distance. Under what condition can the amount of work done can be negative?

(3 marks)

(b) A car initially moved forward at 10 m/s is stopped by a braking force of 12,000 N. This result in a skid mark of a 5.0 m long. How much work was done?

(4 marks)

(c) **Figure Q1(c)** shows a steel ball with a mass of 3.2 kg is on a shelf 1.90 m above the floor. A table top is 1.32 m above the floor. What is the gravitational potential energy of the steel ball with respect to the table top?

(5 marks)

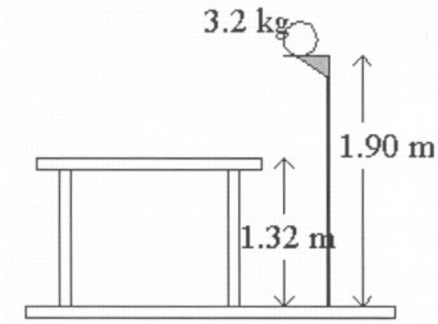


Figure Q1(c)

(d) State the Work-Energy Theorem.

(3 marks)

(e) A small jet aircraft has a mass of 8000 kg. It needs to reach a speed of 70.0 m/s to be able to take off. If it is intended to be used on a runway that is approximately 270 m long, then what force (thrust) must its engines be capable of supplying?

(5 marks)

Q2 (a) If a particle undergoes SHM with amplitude 0.15 m, what is the total distance it travels in one period?

(5 marks)

(b) At what point in the motion of a simple pendulum the string tension greatest? Least? In each case give the reasons for your answer.

(5 marks)

(c) A body vibrates back and forth, with displacement, x (in meter) as a function of time, t (in second) as illustrated in **Figure Q2(c)**.

(i) Find the amplitude of the motion, A.
(ii) Find the period of the motion, T.
(iii) Calculate the frequency of the motion, f.
(iv) At which point will give the highest velocity and then calculate the magnitude of the velocity.

(10 marks)

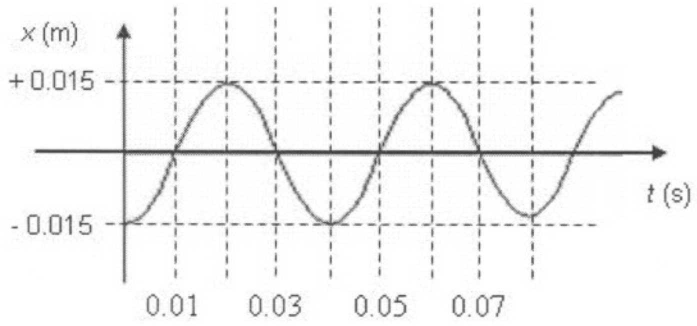


Figure Q2(c)

PART B

Q3 (a) Write the following value in an appropriate form of scientific notation.

(i) 2500 mega pascal (MPa)
(ii) 1550 nano meter (nm).

(4 marks)

(b) Convert the following measurements,

(i) 250 mm^2 into m^2.
(ii) 1000 g cm^{-3} into kg m^{-3}.

(7 marks)

(c) Vectors of **A**, **B** and **C** are illustrated in **Figure Q3(c)**. Answer all the following questions. [Hint: you may use **Table Q3(c)** to get your answer].

(9 marks)

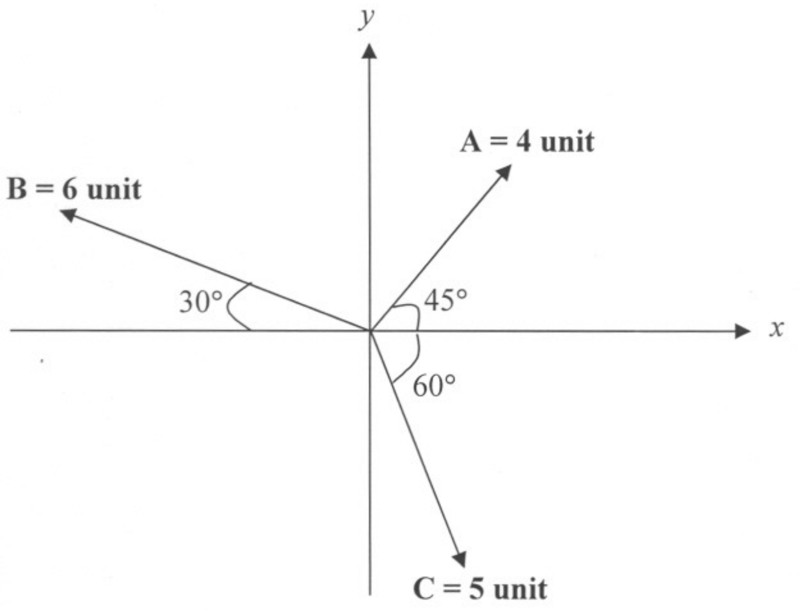


Figure Q3(c)

(i) Rewrite the **Table Q3(c)** and fill in the blank.

Table Q3(c)

Vector	*x*-component	Quadrant notation (+ or -)	*y*-component	Quadrant notation (+ or -)
A = 4 unit				
B = 6 unit				
C = 5 unit				

Q4 (a) The *d-t* graph in **Figure Q4(a)** shows the distance vs. time relationship for object (I) and object (II).

(i) Calculate the speed for each object.
(ii) State the y-intercept for object (II) and explain what it means.
(iii) Use the information in the graph to construct a graph of speed vs. time for the object denoted by graph (II).

(8 marks)

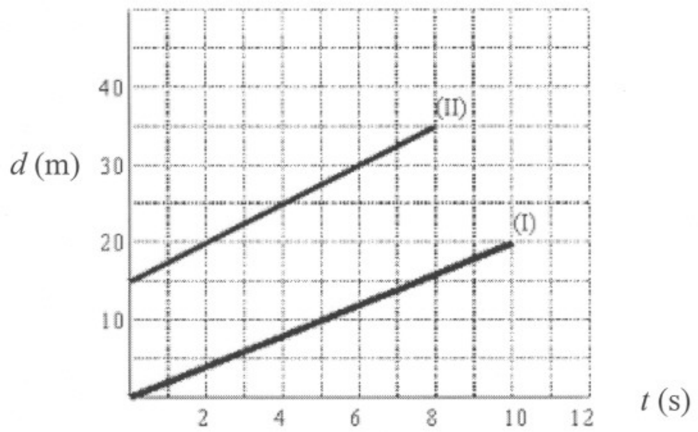


Figure Q4(a)

(b) The velocity, v vs. time, t graph was constructed for an object undergoing uniform motion as in **Figure Q4(b)**.

(i) What was the average speed for the motion?
(ii) What was the total distance traveled after 10 seconds?
(iii) What was the acceleration of the motion?

(5 marks)

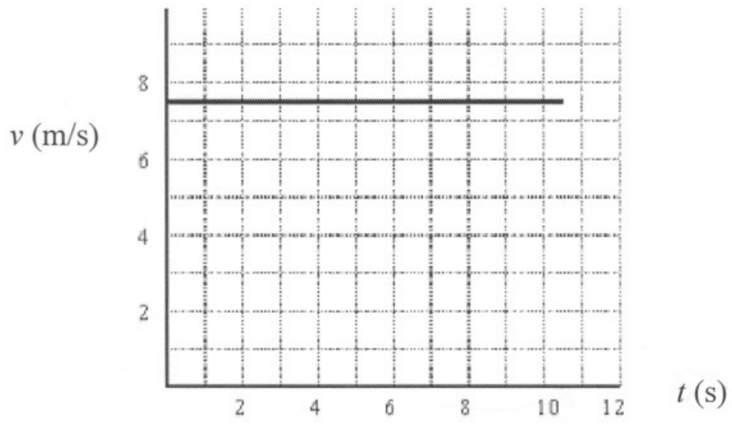
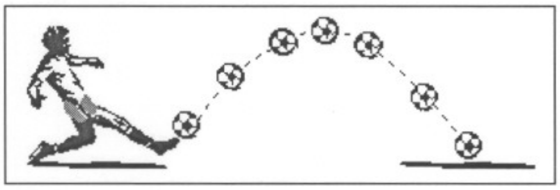


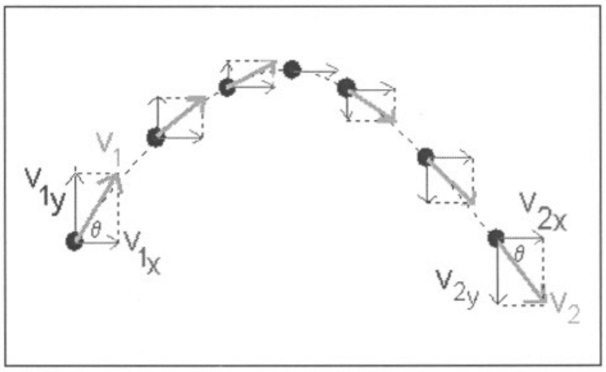
Figure Q4(b)

(c) **Figure Q4(c)(i)** shows the parabolic path of a ball after being kicked by a football player at some angle above the horizon so that it travel and returns to the earth. **Figure Q4(c)(ii)** shows the balls velocity vectors in the horizontal, *x* and vertical, *y* directions.

(i) Describe what is happening to the vertical velocity of the ball.
(ii) What physical quantity that makes the vertical vectors change the way they do?
(iii) Describe what is happening to the horizontal velocity of the ball
(iv) Compare the final velocity of the ball, v_{2y} with its initial velocity, v_{1y}.

(7 marks)





(i) **(ii)**

Figure Q4(c)

Q5 (a) In pushing a box up on an incline plane, between pushing in horizontal and pushing in parallel to the incline plane, which technique required less force? Why? Describe your answer using a schematic drawing.

(5 marks)

(b) Two objects of masses $m_1 = 2.0$ kg and $m_2 = 3.0$ kg are connected by a light string which passes over a smooth pulley as shown in **Figure Q5(b)**. Determine the acceleration of each object and the tension in the string.

(10 marks)

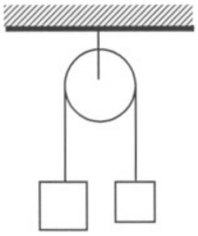


Figure Q5(b)

(c) A 70 kg box is sliding along the floor by a 400 N force. The coefficient of kinetic friction between the box and the floor is 0.50. Find the acceleration of the box.

(5 marks)

Q6 (a) On a simple merry-go-round, Ipin sits 1.5 m from the axis of rotation and Upin sits 2.5 m from the axis. Kak Ros has a stop-watch and finds that the merry-go-round rotates 26 times in one minute. Determine

(i) the rotational speed, ω of Ipin and Upin,
(ii) the linear speed, v_T of Ipin and Upin.

(5 marks)

(b) What is the centripetal acceleration of a point on the perimeter of a bicycle wheel of diameter 70.0 cm when the bicycle is moving at 8.00 m/s? Determine the direction of the centripetal acceleration, a_c.

(5 marks)

(c) A bicycle wheel rotates at angular velocity of 4 rad s^{-1} at $t = 0$ s and undergoing constant angular deceleration of -1.2 rad s^{-2}. Determine

(i) wheel's angular velocity at time $t = 3$ s.
(ii) number of wheel's rotation between $t = 0$ to $t = 3$ s.
(iii) Is it possible at a certain time the wheel will stop rotating? If your answer is YES, at what time the wheel will stop rotating?

(10 marks)

LIST OF CONSTANT AND FORMULAS

Gravity acceleration = 10 m/s^2

$W = F{\cdot}s = Fs\ kos\theta$	$E_u = \frac{1}{2}kx^2 = \frac{1}{2}m\omega^2 x^2$	$s = r\theta$
$K = \frac{1}{2}mv^2$	$E_J = E_k + E_u = \frac{1}{2}m\omega^2 A^2$	$v = r\omega$
$U = mgh$	$R = \sqrt{R_x^2 + R_y^2}$	$a = r\alpha$
$\Delta K = -\ \Delta U$	$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right)$	$\omega = \frac{d\theta}{dt}$
$W_n = \ \Delta K$	$v = u + at$	$\alpha = \frac{d\omega}{dt}$
$\frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = -(mgh_2 - mgh_1)$	$s = ut + \frac{1}{2}at^2$	$a_c = \frac{v^2}{r} = \omega^2 r$
$a = -\ \omega^2 \cdot x$	$v^2 = u^2 + 2as$	$a = r\sqrt{\omega^4 + \alpha^2}$
$f = \frac{1}{T} = \frac{\omega}{2\pi}$	$\sum F = ma$	$\omega = \omega_o + \alpha t$
$v = \omega\sqrt{A^2 - x^2}$	$W = mg$	$\theta = \omega_o t + \frac{1}{2}\alpha \cdot t^2$
$E_k = \frac{1}{2}mv^2 = \frac{1}{2}m\omega^2(A^2 - x^2)$	$f_k = \mu_k . N$	$\omega^2 = \omega_o^2 + 2\alpha \cdot \Delta\theta$
	$P = m \cdot v$	