UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan Profesional dan Pendidikan Berterusan (UTMSPACE)

FINAL EXAMINATION / *PEPERIKSAAN AKHIR*
SEMESTER 2 – SESSION 2016 / 2017
PROGRAM KERJASAMA

COURSE CODE *KOD KURSUS*	:	DDPS 1713 / DDWS 1713
COURSE NAME *NAMA KURSUS*	:	PHYSICS / *FIZIK*
YEAR / PROGRAMME *TAHUN / PROGRAM*	:	1 / DDPA / DDPJ /DDPK / DDWA/ DDWK / DDWJ
DURATION *TEMPOH*	:	2 HOURS 30 MINUTES / *2 JAM 30 MINIT*
DATE *TARIKH*	:	MAC / APRIL 2017

INSTRUCTION/*ARAHAN* :

1. Use acceleration due to gravity 9.81 m/s^2.
   Gunakan pecutan graviti 9.81 m/s^2.

2. Answer **ALL** questions in part A and only five (5) question in part B.
   *Jawab **SEMUA** soalan Dalam Bahagian A dan lima (5) soalan sahaja dalam bahagian B.*

3. Show your working properly with units shown in the final answer when appropriate.
   Tunjukan jalankerja dengan sempurna dan tulis unit pada jawapan akhir sekiranya perlu .

4. Selected formulas are on the last page .
   Rumus terpilih ada dimukasurat terahir.

(You are required to write your name and your lecturer's name on your answer script)
(Pelajar dikehendaki tuliskan nama dan nama pensyarah pada skrip jawapan)

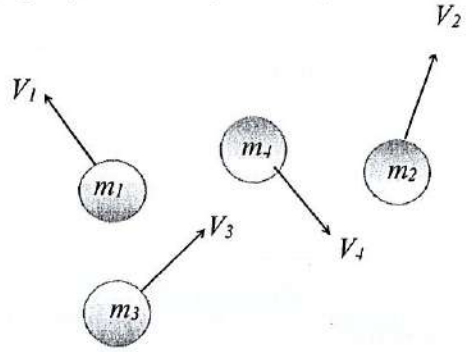
NAME / *NAMA*	:	.....
I.C NO. / *NO. K/PENGENALAN*	:	.....
YEAR / COURSE *TAHUN / KURSUS*	:	.....
COLLEGE NAME *NAMA KOLEJ*	:	.....
LECTURER'S NAME *NAMA PENSYARAH*	:	.....

This examination paper consists of **8** pages including the cover
*Kertas soalan ini mengandungi **8** muka surat termasuk kulit hadapan*

SECTION A/ BAHAGIAN A (20 marks / *markah*)
Answer ALL questions in this section / *Jawab SEMUA soalan dalam bahagian ini.*

1. **Every measurement has certain errors. Explain,**
   (a) the meaning of error and,
   (b) the difference between between systematic error and random error.
   Setiap pengukuran mempunyai ralat tertentu. Terangkan,
   (a) maksud ralat dan,
   (b) perbezaan diantara ralat sistematik dan ralat rawak.

2. **A system of moving objects have a total momentum of zero. Is the total kinetic energy is also zero? Explain by referring to Figure 1.**
   Sistem beberapa jasad yang bergerak mempunyai jumlah momentum sifar. Adakah jumlah tenaga kinetik system juga sifar? Terangkan dengan meruiuk kepada Rajah 1.



System of objects/*sistem objek-objek*

Figure 1 / *Rajah 1*

3. **State the Newton's THIRD law of motion.**
   Nyatakan hukum gerakan Newton yang KETIGA.

4. **There are two types of frictional forces.**
   (a) Name both of them
   (a) Explain their differences.
   Terdapat dua jenis daya geseran.
   (a) Namakan kedua duanya.
   (b) Terangkan perbezaan mereka.

5. **Two cannonballs A and B in Figure 2, are fired from the ground with identical initial speeds but with angles θ_A larger than θ_B. Which cannonball stays longer in the air? Explain with the aids of formula.**
   Dua peluru meriam, A dan B dalam Rajah 2, ditembak dari pemukaan bumi pada kelajuan awal yang sama tetapi pada sudut θ_A yang lebih besar dari θ_B. Peluru meriam manakah yang lebih lama berada di udara? Terangkan dengan bantuan rumus.

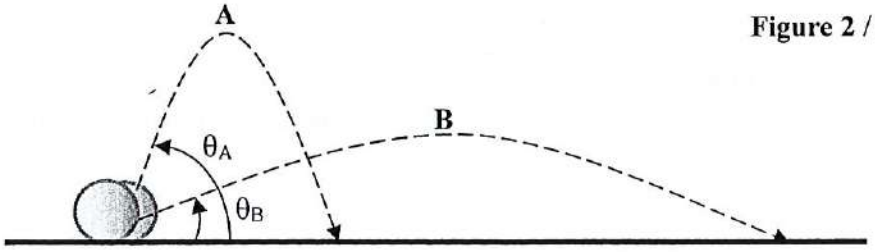


Figure 2 / *Rajah 2*

6. **A child stands in an elevator that is accelerating upwards with acceleration a.**
   (a) Name all the forces that acts on the child.
   (b) What is the relationship (in terms of equation) between the forces and the acceleration of the child? Refer to Figure 3.
   Seorang budak berada dalam keadaan rehat didalam sebuah lif yang sedang memecut ke atas dengan pecutan a.
   (a) Namakan semua daya-daya yang bertindak keatas budak.
   (b) Apakah hubungan (dalam bentuk persamaan) diantara daya-daya tersebut dan pecutan budak tersebut? Rujuk pada Rajah 3.

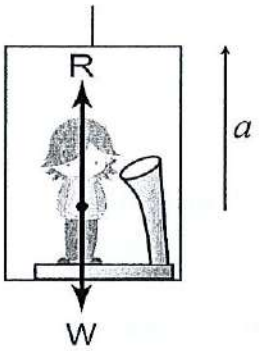
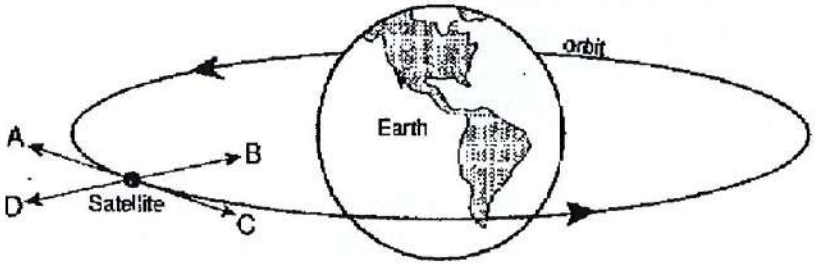


Figure 3 / *Rajah 3*

7. **State which arrow in Figure 4 below, points to the direction of:**
   (a) the centripetal acceleration of the satellite?
   (b) the velocity of the satellite?
   Nyatakan anak panah yang manakah dalam Rajah 4 dibawah, yang menunjukkan arah:
   (a) pecutan memusat satelit?
   (b) halaju satelit?

Figure 4 / *Rajah 4*



8. **What is Simple Harmonic motion? At what position from the center of oscillation (the equilibrium point) that the:**
   (a) kinetic energy is maximum?
   (b) acceleration is maximum?
   Apakah Gerakan Harmonik Mudah? Pada kedudukan manakah dari pusat ayunan (itik keseimbangan):
   (a) tenaga kinetik adalah maksimum?
   (b) pecutan adalah maksimum?

9. **Graph in Figure 5 shows displacements of a few particles of medium in a transverse wave versus the distance from the source at points labeled A, C, D, E, F, G and R.**
Graf dalam Rajah 5 menunjukkan sesaran beberapa zarah-zarah medium dalam gelombang melintang melawan jarak dari punca gelombang bagi titik-titik berlabel A, C, D, E, F, G dan R.

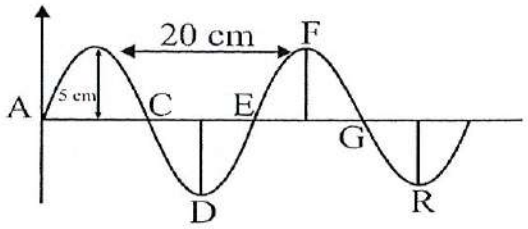


Figure 5 / *Rajah 5*

Which two particles
(a) vibrate with the same phase.
(b) vibrate with opposite phase.
Manakah pasangan zarah-zarah yang
(a) berayun dengan fasa yang sama.
(b) berayun dengan fasa yang bertentangan.

10. **Interference pattern of stationary waves has points of notes and antinodes.**
(a) Describe how stationary waves are formed.
(b) What are points nodes and antinodes?
Corak inteferen bagi gelombang pegun ada titik-titik nod dan antinod.
(a) Terangkan bagaimana gelombang pegun terbentuk.
(b) Apakah titik-titik nod dan antinod?

SECTION B / ***BAHAGIAN B*** **(40 marks** / *markah*)
Answer five (5) questions only / *Jawab lima (5) soalan sahaja.*

1. **A car with mass 1500kg moves in horizontal circle .If the radius of the circle is 35m and the coefficient of friction of the dry road is μ_s=0.5,**
(a) Draw a free body diagram of all forces that acted on the car.
(b) Calculate the force of friction between the wheel of car and the road.
(c) Calculate the maximum velocity for the car to take the turn safely.
(d) If the same car driving on this road in a rainy day, skids when the car reach 8m/s, find the coefficient of friction of this wet road.
Sebuah kereta yang berjisim 1500kg sedang bergerak dalam bulatan mendatar. Jika jejari bulatan 35m dan pekali geseran jalan yang kering , μ_s = 0.5,
(a) Lakarkan bebas jasad bagi semua daya-daya yang bertindak ke atas kereta.
(b) Kirakan daya geseran diantara roda kereta dan jalan.
(c) Kirakan laju maksima bagi kereta supaya membelok dengan selamat.
(d) Katakan kereta melalui jalan ini pada hari hujan dan mulai tergelincir apabila laju kereta mencapai 8 m/s. Kirakan pekali geseran statik jalan basah ini.

2. **Arif pushes a 14.0kg lawn mower at a constant speed with a force of 88.0N directed along the handle of the mower, which is inclines 45° to the horizontal as shown in Figure 6.**
Arif menolak pemotong rumput se berat 14.0kg dengan halaju malar dengan daya 88.0N arah sepanjang pemegang pemotong rumput tersebut iaitu 45° dari ufuk seperti yang ditunjukkan dalam Rajah 6.

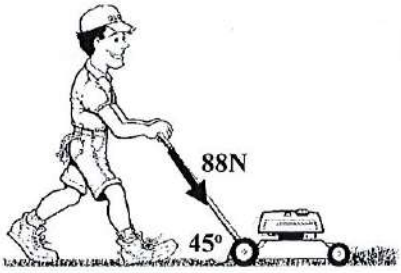


Figure 6 / *Rajah 6*

(a) Draw a free body diagram showing all forces acting on the mower.
(b) Calculate the frictional force.
(c) Normal reaction force exerted on the mower by the ground.
(d) Coefficient of kinetic friction.
(a) Lakarkan rajah bebas daya bagimenunjukkan semua daya-daya yang bertindak keatas mesen.
(b) Kirakan daya geseran
(c) Daya tindakbalas normal di kenakan ke atas pemotong rumput oleh tanah.
(d) Pekali geseran kinetik.

3. **In 2009, NASA's spacecraft Messanger, orbits above Mercury's surface at a height of 125 miles.**
(a) Change 125 miles to meter.
(b) Calculate the orbital period and speed of spacecraft Messenger.
(c) Calculate the gravitational field of Mercury?
(Given that $R_{Mercury} = 2.44 \times 10^6$ m, $M_{Mercury} = 3.30 \times 10^{23}$ kg and 1 mile = 1609 m)
Dalam tahun 2009, kapal angkasa NASA, Messenger mengorbit planet Utarid pada ketinggian 125 batu dari pemukaan Utarid.
(a) Tukarkan 125 batu kepada meter.
(b) Kirakan laju dan tempoh orbit kapal angkasa Messenger.
(c) Kirakan medan graviti Utarid?
(Diberi bahawa jejari Utarid=2.44×10^6m, jisim Utarid= 3.30×10^{23}kg dan 1 batu =1609m).

4. **Figure 7 in the next page shows a displacement-time graph for a vibrational object.**
(a) Determine the amplitude, period and the frequency of the object.
(b) Write the equation of the displacement versus time graph as shown in the Figure 7.
(c) What is the velocity of the object at $t = 0.3s$?
Copy the graph in your answer booklet, and sketch in the same graph another wave whose frequency is twice and amplitude is half of the the first wave.
Rajah 7 di mukasurat sebelah menunjukkan graf sesaran masa bagi objek yang bergetar.
(a) Tentukan amplitud, tempoh dan frekuensi objek
(b) Tuliskan persamaan sesaran melawan masa seperti yang ditunjukkan dalam Rajah 7.
(b) Halaju geteran objek pada masa $t = 0.3s$
Salin graf di bawah dan lakarkan pada paksi yang sama , satu lagi graf gelombang yang mempunyai frekuensi dua kali ganda dan amplitud setengah dari gelombang pertama.

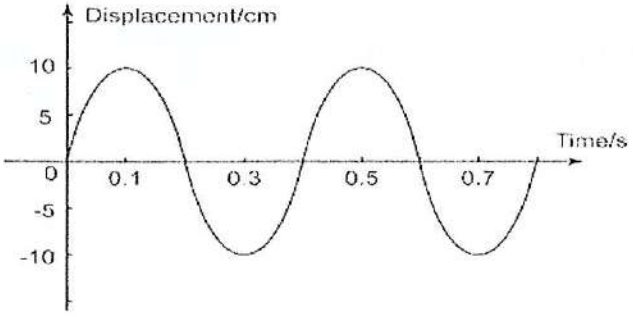


Figure 7/ *Rajah 7*

5. **Three point charges are arranged in a straight line as shown in Figure 8 below.**
   (a) Sketch the free body diagram for ALL point charges individually.
   (b) What is the value of x so that the charge in the middle do not feel any force? $F_{total} = 0$
   (c) What is the total electrostatic potential energy for this system of charges.
   (Given : $U_{total} = q_1V_{23} + q_2V_{13} + q_3V_{12}$)

   Tiga cas titik disusun sebaris atas garis lurus seperti ditunjukkan dalam Rajah 8 dibawah.
   (a) Lakarkan rajah bebas jasad untuk semua cas-cas secara berasingan.
   (b) Apakah nilai x supaya cas yang di tengah tidak merasai sebarang daya? $F_{total} = 0$
   (c) Apakah tenaga potensi elektrostatik sistem cas-cas ini?
   (Diberi : $U_{total} = q_1V_{23} + q_2V_{13} + q_3V_{12}$)

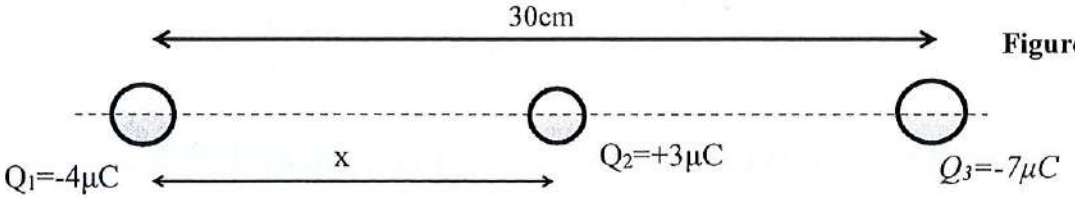
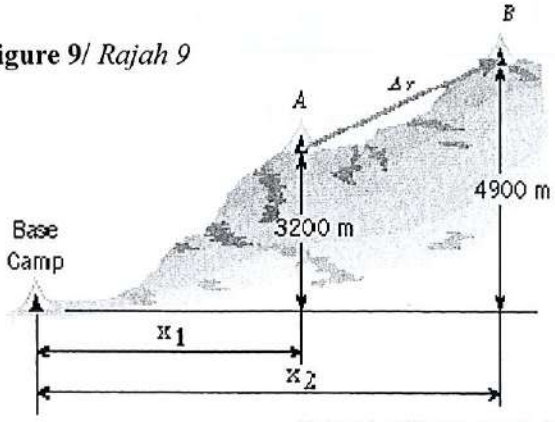


Figure 8/ *Rajah 8*

6. **A 65kg mountain climber climbs to the top of the 4900m height of the mountain in 5 hours from the height of 3200m as shown in Figure 9.**
   Seorang pendaki gunung berjisim 65 kg memanjat ke puncak se buah gunung setinggi 4900m daripada ketinggian 3200m, dalam masa 5 jam seperti dalam Rajah 9.

Figure 9/ *Rajah 9*



Calculate
(a) the work done against the gravity
(b) the average power output in Watt
(c) the rate of which the input power required if the climber is only 15% efficient.

Kirakan,
(a) Kerja yang di lakukan melawan gravity
(b) Purata kuasa yang di gunakan dalam Watt
(c) Kadar di mana kuasa masuk yang di perlukan sekiranya kecekapan pendaki hanyalah 15%.

QUESTIONS END / SOALAN-SOALAN TAMAT

SELECTED FORMULA/ *RUMUS TERPILIH*

KINEMATICS

$$v = u + at$$
$$v^2 = u^2 + 2aS$$
$$S = ut + \frac{1}{2}at^2$$
$$S = \frac{1}{2}(u + v)t$$

FREE FALL

$$v = u + gt$$
$$v^2 = u^2 + 2gH$$
$$H = ut + \frac{1}{2}gt^2$$
$$H = \frac{1}{2}(u + v)t$$

MOMENTUM

$$F = \frac{m(v-u)}{t} = ma$$
$$P = mv$$
$$I = Ft = mv - mu$$

SATELLITE

$$P.E. = \frac{Gm_1m_2}{r_{12}}$$
$$K.E. = \frac{Gm_1m_2}{2r_{12}}$$

PROJECTILE

$$v_y = u_y + at$$
$$v_y^2 = u_y^2 + 2gY$$
$$Y = u_y t + \frac{1}{2}gt^2$$
$$Y = \frac{1}{2}(u_y + v_y)t$$
$$X = u_x t$$
$$u_x = v_x$$
$$T = \frac{2u\sin\theta}{g}$$
$$R = \frac{2\sin 2\theta}{g}$$

GRAVITATION

$$E = \frac{GM}{r^2}$$
$$F = \frac{Gm_1m_2}{r^2}$$
$$M = \frac{r^3}{G}\left(\frac{2\pi}{T}\right)^2$$
$$T = 2\pi\sqrt{\frac{r^3}{GM}}$$
$$r = \sqrt[3]{\frac{GM}{\omega}} = \sqrt[3]{\frac{T^2GM}{4\pi^2}}$$
$$r_{altitude} = r - R_{Earth}$$

CIRCULAR MOTION AND SHM

$$s = r\theta$$
$$v = r\omega = \frac{2\pi r}{T}$$
$$a_c = r\omega^2 = \frac{v^2}{r}$$
$$\omega = 2\pi f = \frac{2\pi}{T}$$
$$W = mg$$
$$V_{max} = \pm\omega A$$
$$a_{max} = \pm\omega^2 A$$
$$KE_{max} = \frac{1}{2}m\omega^2A^2$$
$$a = -\omega^2 x, k = m\omega^2$$
$$f = \frac{1}{T}, T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{l}{g}}$$
$$v = \pm\omega\sqrt{A^2 - x^2}$$
$$x = A\sin(\omega t \pm \Phi)$$
$$v = A\omega\cos(wt \pm \Phi)$$
$$a = -A\omega^2\sin(\omega t \pm \Phi)$$
$$E_{total} = \frac{1}{2}m\omega^2A^2$$
$$KE = \frac{1}{2}m\omega^2(A^2 - x^2)$$
$$PE = \frac{1}{2}m\omega^2x^2$$

WORK & ENERGIES

$$KE = \frac{1}{2}mv^2$$
$$GPE = mgh$$
$$EPE = \frac{1}{2}kx^2$$
$$work = F \times d \times \cos\theta$$
$$power = \frac{energy}{time}$$
$$power = \frac{work}{time} = \frac{Fd\cos}{t}$$
$$power = Fv\cos\theta$$

WAVES

$$v = f\lambda$$
$$k = \frac{2\pi}{\lambda}$$
$$\Phi = \frac{2\pi x}{\lambda}$$
$$x = A\sin(\omega t \pm kx \pm \Phi)$$
$$v = A\omega\cos(wt \pm kx \pm \Phi)$$
$$a = -A\omega^2\sin(\omega t \pm kx \pm \Phi)$$
$$v_d = \frac{I}{neA}$$

ELECTROSTATICS

$$F = \frac{kq_1q_2}{r^2} = qE$$
$$E = \frac{kq_1}{r^2}$$
$$U = \frac{W}{q} = \frac{kq}{r}$$
$$C = \frac{Q}{V} = \frac{\varepsilon A}{d} = \frac{\varepsilon_r\varepsilon_0 A}{d}$$
$$Energy = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C}$$
$$R = \frac{\rho l}{A},$$
$$V = IR,$$
$$Power = I^2R = \frac{V^2}{R} = IV$$