國　立　宜　蘭　大　學

101 學年度轉學招生考試

（考生填寫）
准考證號碼：

物　理　試　題

《作答注意事項》

1. 請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
2. 考試時間：80 分鐘。
3. 本試卷共有選擇題 18 題，一題 5 分，計算題 1 題 10 分，共計 100 分。
4. 請將答案寫在答案卷上（於本試題上作答者，不予計分）。
5. 考試中禁止使用大哥大或其他通信設備。
6. 考試後，請將試題卷及答案卷一併繳交。
7. 本試卷採雙面影印，請勿漏答。
8. 本試題附計算紙一張。

常數： $c=3.0\times10^8$ m/s, $m_e=9.11\times10^{-31}$ kg, $E_{photon}=1240(eV\cdot nm)/\lambda(nm)$

$\pi=3.142$, $\pi^2=9.870$, $1/\pi=0.3183$, $\sigma=5.67\times10^{-8}$ watt/m$^2\cdot$K^4

重力加速度 $g=10m/s^2$, $k_e=9.0\times10^9$, $Nt\cdot m^2/Coul^2$, $e=1.60\times10^{-19}$ Coul, $h=6.626\times10^{-34}$ J·s $=4.14\times10^{-15}$ eV·s

$\sqrt{3}=1.732$, $\sqrt{2}=1.414$

單選題 18 題，每題 5 分

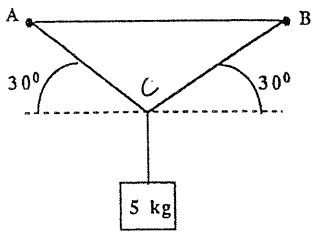
1. Which of these numbers is the best estimate of the number of seconds in 75 years?
(A) 3.3×10^8 (B) 9.0×10^8 (C) 2.2×10^9 (D) 6.1×10^9 (E) 2.0×10^{10}

2. A vector has a magnitude of 12. When its tail is at the origin it lies between the positive x axis and negative y axis and makes an angle of 30° with the x axis. Its y component is:
(A) $6\sqrt{3}$ (B) $-6\sqrt{3}$ (C) 6 (D) – 6 (E) 12

3. A rocket at a height of 3050 m is traveling upwards at 305 m/s, and releases a camera that was used to photograph the launch. How long does it take the camera to fall freely to the earth?
(A) 24 sec (B) 31.2 sec (C) 10 sec (D) 55.7 sec (E) 71 sec

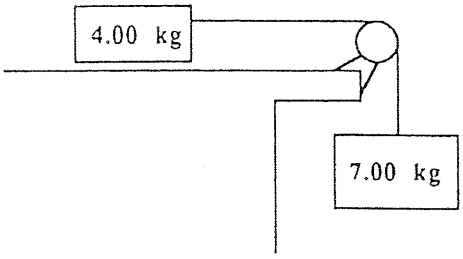
4. A lady drives her small car around a level circular track of radius 150 m. Her speed is increasing at a constant rate of 10 m/s^2. Calculate the angle between the velocity v and the acceleration of the car when its speed is 30 m/s. Answers in degrees.
(A) 90 (B) 59 (C) 44 (D) 37 (E) 31

5. A rope is fixed at the points A and B. Calculate the magnitude of the tension in the rope between A and C. (Answer in Newtons.)



(A) 49
(B) 50
(C) 98
(D) 100
(E) 280

6. The coefficient of friction between the 4.00 kg object and the bench-top on which it slides is 0.300. What is the speed of the 7.00 kg mass when it has fallen a vertical distance of 2.00 m, if the system is released from rest? (Answers in m/s.)



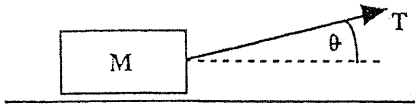
(A) 3.10
(B) 4.55
(C) 9.62

背面尚有試題

(D) 19.2
(E) 31.0

7. A block of mass M is pushed up an incline of slope 3/4 by a horizontal force equal to twice its weight. If the coefficient of kinetic friction between the block and the incline is $\mu = 0.25$, what is the acceleration of the block along the incline?
(A) $g/5$ (B) $g/2$ (C) $3g/4$ (D) $4g/5$ (E) g

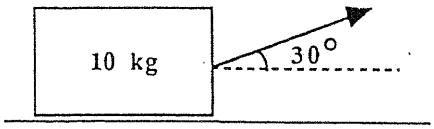
8. A block of mass m is pulled along a rough horizontal floor by an applied force T as shown. The vertical component of the force exerted on the block by the floor is:



(A) mg
(B) $mg - T\cos\theta$
(C) $mg + T\cos\theta$
(D) $mg - T\sin\theta$
(E) $T\sin\theta$

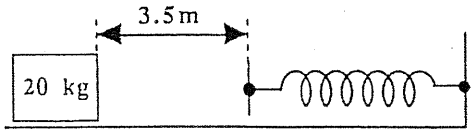
9. A pendulum consists of a 0.500 kg mass on the end of a light rod 50.0 cm long. It was set swinging so that the greatest angle the rod makes with the vertical was 30.0°. After 5 hours and 30 minutes it was seen to come to rest at its lowest position. How much work was done on the pendulum by the frictional forces? (Answer in J)
(A) – 1.225 (B) – 0.825 (C) + 0.450 (D) – 0.328 (E) 0

10. A man pulls a 10 kg block 10 meters along a level floor at a constant speed with a force directed 30° above the horizontal. If the coefficient of kinetic friction between the block and floor is 0.20, how much work does the man do on the block?



(A) 20
(B) 146
(C) 170
(D) 176
(E) 203

11. A 20 kg block is 3.5 m away from a stiff spring and moving towards it at 5.0 m/s along a rough horizontal surface. The spring has an elastic constant $k = 500$ N/m and it gets compressed 0.50 m after the block strikes it. What is the coefficient of kinetic friction between the block and the rough surface?

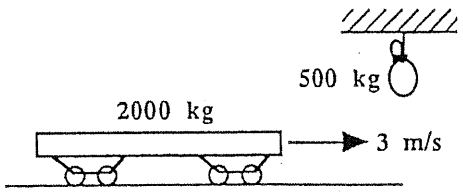


(A) 0.24
(B) 0.32
(C) 0.18

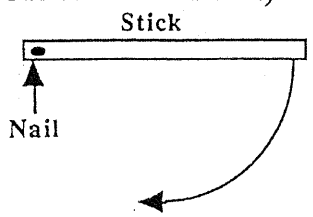
(D) 0.54
(E) 0.84

12. A massless spring is compressed between blocks of mass $5M$ and M on a smooth horizontal table. When the system is released, the energy of the spring is shared between the blocks such that:
(A) The mass M gets 5/6 of the energy
(B) The mass M gets 4/5 of the energy
(C) The mass M gets 1/2 of the energy
(D) The mass M gets 1/5 of the energy
(E) The mass M gets 1/6 of the energy

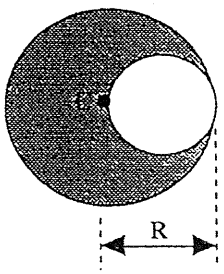
13. A 500 kg sack of coal is dropped onto a 2000 kg railroad flatcar which was initially moving at 3 m/s. After the sack is added, the speed of the flatcar is: (Answer in m/s.)
(A) 0.6
(B) 1.2
(C) 1.8
(D) 2.4
(E) 3.6



14. A meter stick has a small hold drilled at one end so that it can swing freely on a nail in the wall. The stick is pulled to one side until it is horizontal, then released from rest. What is the angular speed of the stick as it swings through the vertical position? Answers in radians/sec. (The moment of inertia of a thin uniform rod is $ML^2/12$ about its center and $ML^2/3$ about its end.)
(A) 34
(B) 17
(C) 5.4
(D) 4.4
(E) 3.1



15. A uniform disc of radius R centered at C has a hole of diameter R cut out as shown. The resulting object has a mass M. Calculate its moment of inertia about a perpendicular axis through C.
(A) (1/8) R^2
(B) (3/16) MR^2
(C) (1/4) MR^2
(D) (13/24) MR^2
(E) (1/2) MR^2



16. Earth's moon is approximately spherical in shape with radius r = 1743 km and acceleration due to gravity g = 1.67 m/s^2 at its surface. Determine the mean density of the moon (in kg/m^3. Take $G = 6.67\times10^{-11}$ N·m^2/kg^2).

(A) 1.97×10^3

(B) 3.44×10^3

(C) 5.51×10^3

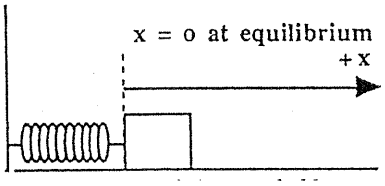
(D) 2.02×10^4

(E) 2.02×10^7

17. A table moves horizontally with SHM of frequency 10.0 Hz. A 5 kg block lies on the table. The coefficient of static friction between the block and the table is 0.5, while the coefficient of kinetic friction is 0.25. What is the largest possible amplitude so that the block doesn't slip on the table? Answers in cm.

(A) 0.12 (B) 7.8 (C) 12 (D) 78 (E) 120

18. A spring mass system will oscillate with a frequency of 3.0 Hz. Determine the displacement in m as a function of time in sec. if the block is displace to x_0 = +0.30 m and given a velocity v_0 = –5.0 m/s at t = 0. Express any phase constant in radians.



(A) 0.40 cos (6.0 πt – 0.85)

(B) 0.30 cos (3.0 πt + 2.3)

(C) 0.40 cos (6.0 πt + 0.85)

(D) 0.50 cos (6.0 πt – 2.3)

(E) 0.40 sin (6.0 πt + 2.3)

計算問答題 **1** 題，每題 **10** 分，需詳列過程

1. Write an equation in SI units for a wave traveling in the negative direction along the x-axis and having an amplitude of 10 cm, a frequency of 125 Hz, and a speed of 250 m/sec.