

考 試 科 目	普通物理(-) General Physics I	所 別	應用物理 (8162) (8163)	考 試 時 間	3月14日 星期六	第 三 節
---------	------------------------------	-----	-----------------------	---------	--------------	-------

NOTE: Please answer the following questions one by one, and the detailed calculations should be given.

1. Please show that the acceleration vector in uniform circular motion is  $-\frac{v^2}{r}\hat{r}$ , where  $r$  is the radius of the circle and  $v$  is the speed of the particle. (10 points)
2. Consider a long thin rod with rotation axis through its center. Prove its moment of inertia is  $\frac{1}{12}ML^2$ , where  $M$  and  $L$  are corresponding to mass and length of the long thin rod, respectively. (10 points)
3. Give a brief description about the operating principle of antilock braking systems (ABS). (10 points)
4. A sinusoidal wave on a string is described by the following equation  $y = (0.15m)\sin(0.8x - 50t)$  where  $x$  and  $y$  are in meters and  $t$  is in seconds. If the mass per unit length of this string is 12 g/m, determine the power transmitted to the wave. (10 points)
5. A uniform rod of mass  $M$  and length  $L$  is pivoted about one end and oscillates in a vertical plane. Find the period of oscillation if the amplitude of the motion is small. (10 points)
6. Consider a disk of radius  $R$  and mass  $M$  rolling without slipping on an inclined plane of angle  $\theta$ . Find the static friction between disk and inclined plane. (10 points)
7. How to measure the flow speed of an incompressible fluid? Give an example to address. (10 points)
8. Give an example to address that why the total entropy of an isolated system always increases when the process is irreversible. (10 points)
9. Consider a heat engine operated under a Carnot cycle, in which an ideal gas is contained. Prove the efficiency of Carnot engine as  $e_c = 1 - \frac{T_c}{T_h}$ , where  $T_h$  is an operation temperature during isothermal expansions and  $T_c$  is operated during isothermal compressions. (20 points)

備 考 試 題 隨 卷 繳 交

命 題 委 員 : (簽章)

命題紙使用說明：1. 試題將用原件印製，敬請使用黑色墨水正楷書寫或打字（紅色不能製版請勿使用）。

2. 書寫時請勿超出格外，以免印製不清。

3. 試題由郵寄遞者請以掛號寄出，以免遺失而示慎重。