

國立中央大學101學年度碩士班考試入學試題卷

所別：系統生物與生物資訊研究所碩士班 不分組(一般生)
本科考試禁用計算器

科目：普通物理

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*請在試卷答案卷(卡)內作答

1. A uniform rod of weight $W_1 = 35\text{N}$ is supported at its end as shown in Fig.1. A block of weight $W_2 = 10\text{N}$ is placed one-quarter of the distance from one end. What are the forces exerted by the supports? (10 pts)
2. During a storm, a crate of crepe is sliding across a slick, oily parking lot through a displacement $\vec{d} = (-3.0\text{m})\hat{i}$ while a steady wind pushes against the crate with a force $\vec{F} = (2.0\text{N})\hat{i} + (-6.0\text{N})\hat{j}$. The situation and coordinate axes are shown in Fig.2.
 - (a) How much work does this force do on the crate during the displacement? (5 pts)
 - (b) If the crate has a kinetic energy of 10 J at the beginning of displacement \vec{d} , what is its kinetic energy at the end of \vec{d} ? (5 pts)
3. A child's top is spun with angular acceleration $\alpha = 5t^3 - 4t$, with t in seconds and α in radians per second-squared. At $t=0$, the top has angular velocity 5 rad/s, and a reference line on it is at angular position $\theta=2$ rad.
 - (a) Obtain an expression for the angular velocity $\omega(t)$. (5 pts)
 - (b) Obtain an expression for the angular position $\theta(t)$. (5 pts)
4. Water emerges from a hole at the bottom of a large tank, as shown in Fig.3. If the depth of water is h , What is the speed at which the water emerges? (10 pts)
5. The absolute pressure in an automobile tire is P_1 at T_1 . After a long drive the temperature rises to T_2 . What is the new pressure? (10 pts)
6. Three moles of helium are initially at T and pressure of P . What is the work done by the gas if the volume is doubled (a) at constant pressure (5 pts), or (b) isothermally? (5 pts) (You can use R to be the gas constant.)
7. A thin insulating rod of length L carries a uniformly distributed charge Q . Find the field strength at a point along its axis at a distance a from one end. (10 pts)

注意：背面有試題

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8. The potential due to a point charge is given by $V = kQ/r$. Find (a) the radial component of the electric field (5 pts); (b) the x component of the electric field. (5 pts)
9. An infinite straight wire of radius R carries a current I . Find the magnetic field at a distance r from the center of the wire for (a) $r > R$ (5 pts), and (b) $r < R$ (5 pts). Assume that the current is uniformly distributed across the cross section of the wire.
10. A small object is placed 16 cm from a converging lens that has a focal length of 12 cm. (a) Locate the image (5 pts) and determine its transverse magnification. (5 pts)

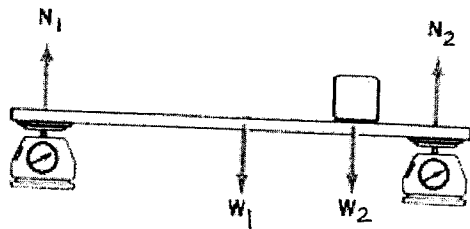


Fig.1

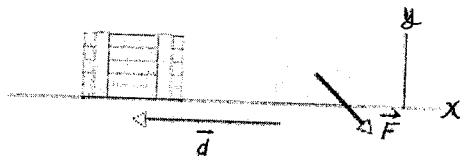


Fig.2

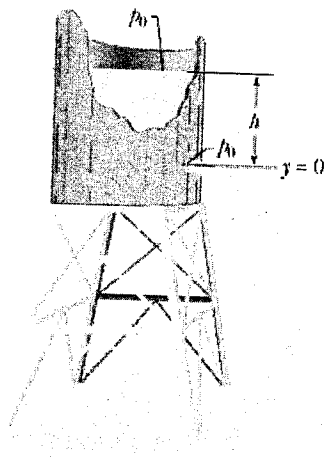


Fig.3

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