國立嘉義大學 100 學年度轉學生招生考試試題

科目：普通物理　　＜請將答案寫在答案卷上＞

I. 選擇題 （每小題 5 分，共 20 分）

1. At $t=0$, a 12.0-V battery is connected in series with a 220-mH inductor and a total of 30-Ω resistance. Which is correct?
   (a) at $t=0$, the current is 0.40 A;
   (b) as $t\to\infty$, the current decays to zero;
   (c) the time constant is about 7.3 ms;
   (d) it take 50 s for the current to reach half its maximum possible value.

2. Which of the following statement is NOT the second law of thermodynamics?
   (a) the entropy of a closed system can never decrease;
   (b) the entropy of the universe can never decrease;
   (c) it is impossible to construct a refrigerator operating in a cycle whose sole effect is to transfer heat from a cooler object to a hotter one;
   (d) the change in the internal energy of a system depends only on the net heat transferred to the system and the net work done by the system, independent of the particular processes involved.

3. When a current-carrying conductor is held fixed in a magnetic field, the field exerts a sideways force $\vec{\mathbf{F}}_B=-q_e\vec{\mathbf{v}}_d\times\vec{\mathbf{B}}$ on the charges moving in the conductor. This is the
   (a) Hall effect;　(b) Meisner effect;　(c) quantum-size effect;　(d) edge effect.

4. The SI unit for Poynting vector $\vec{\mathbf{S}}=\vec{\mathbf{E}}\times\vec{\mathbf{B}}/\mu_0$ is (a) A;　(b) T;　(c) W/m^2;　(d) W.

II. 計算題 （每小題 20 分，共 80 分)

1. 一個 100 kg 的飛行員駕駛飛機以 360 km/h 作半徑 2 km 的迴轉，求飛行員的視重量為何？ (空氣對飛機所造成的上升力垂直於機翼)

2. 半徑 R 質量 m 的圓盤由高 h 斜角 θ 的斜面上釋放後只滾不滑，求
   (a) 圓盤的轉動慣量?　(b) 到達底部時的速率? (假設不計任何耗散力)

3. 考慮理想氣體 1 莫耳在壓力 1 atm 下準靜膨脹過程溫度升高 1K，假設體積變化 +100 cm^3，1 莫耳 = 30g，定壓比熱 C_p = 0.72 kJ/kg・K，則
   (a) 系統吸收熱量? 對外做功?　(單位 J)
   (b) 考慮理想氣體等容準靜膨脹過程吸收熱量 $Q_v=nC_v\Delta T$，求出 $C_p-C_v=R$，R 是理想氣體常數。

4. 有一 60.0-Hz 的正弦電磁波往 z 方向傳播，其電場 $\vec{\mathbf{E}}$ 指向 x 向，大小為 E_p = 2.00 V/m. 假設光速 $c\approx3.0\times10^8$ m/s. 求
   (a) 波長 (b) 波數 (c) 角頻率 (d) 電磁波的磁場大小