國防大學理工學院 102 學年度博、碩士班招生■博士班□碩士班 考試試題			
系(所)別：國科所環資組	考試科目：基礎學能	第 1 頁，共 2 頁	考試時間 80 分鐘

問答及計算題(共 20 題，每題 5 分，共計 100 分)

1、請說明何謂「全球定位系統(GPS)」並敘述其用途為何？

2、在星載的感測器中有那些波段的感測器是常見的？

3、何謂地球同步(守視)衛星及太陽同步衛星？

4、何謂光的三原色，並說明何為「加色」效果？

5、試說明土木工程(Civil Engineering)之特性？

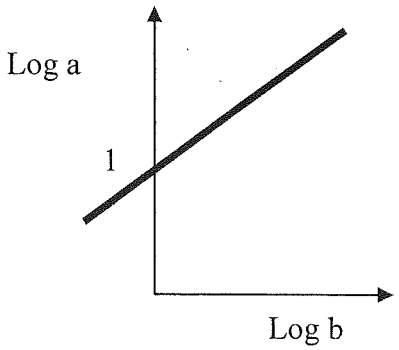
6、造成台灣如地震、水災等各種環境災害頻仍之原因為何？請詳述之。

7、2005 年卡崔娜颶風(Hurricane Katrina)與 2009 年莫拉克颱風(Typhoon Morakot)分別造成美國與台灣兩地有史以來最嚴重之災情，此氣候異常(極端氣候)發生頻率愈來愈高，其強度愈來愈大，造成全球氣候異常發生的原因為何？

8、何謂綠建築(Green Building)？請定義之。

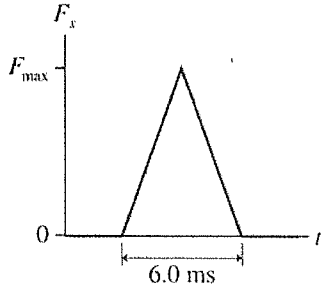
9、請說明汽車上的防鎖死剎車系統(ABS, Antilock Brake System)的功用及其操作時之物理機制。

10、某實驗之結果繪在對數圖紙上，呈現出一斜率為 3 且與垂直軸交於 1 之直線如下圖所示，請寫出圖中 a 參數與 b 參數的關係方程式。



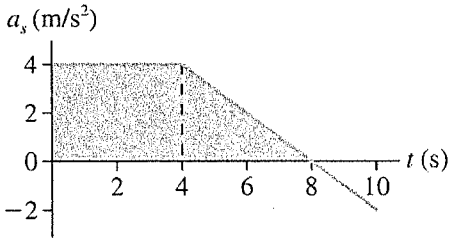
11、一密度為 5 g/cm^3 的物體沉入密度為 1.5 g/cm^3 的 A 液體中以彈簧秤測得其質量為 7 kg；再將該物體沉入 B 液體中測得其質量為 6.4 kg，問 B 液體密度為何？

12、王建民將質量 100 公克的棒球以時速 150 公里投出，打者打中該球後，該球以時速 300 公里向王建民飛去，球和棒子的交互作用力及作用時間如下圖所示，請問棒子作用在球上的最大力(Maximum Force F_{max})為何？



13、請寫出下列數據的有效數字個數，並將此四個數據的有效數字依大至小排列出來。
a.1900　b.0.0023　c.0.240　d.1.234×10^{-10} 。

14、下圖為某一質點的加速度和時間的對應圖，該質點初速為 10 m/s 請問 t = 4 s 時，質點的速度為多少？



15、矩陣 $\mathbf{A}=\begin{bmatrix}6 & 5 & 3\\ 5 & 2 & -1\\ 4 & -1 & 9\end{bmatrix}$ 可表示成一對稱矩陣 **B** 與反對稱矩陣 **C** 之和，請寫出矩陣 **B** 與 **C**。

16、利用高斯消去法解聯立方程式：$\begin{aligned}3x+y-z&=2\\ 2x+3y+z&=0\\ x+5y+2z&=6\end{aligned}$

17、解 $(4x+3y^2)dx+2xydy=0$

18、求 $(x^2+y^2)dx=2xydy$ ， $y(-1)=0$ 之特解。

19、計算行列式值 $|\mathbf{A}|=\begin{vmatrix}1 & 24 & 21 & 93\\ 2 & -37 & -1 & 194\\ -2 & 35 & 0 & -171\\ -3 & 177 & 63 & 150\end{vmatrix}=?$

20、解 $(3x+2)^2y''+3(3x+2)y'-36y=3x^2+4x+1$ 。

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系(所)別：國科所電機組	考試科目：基礎學能	第 1 頁，共 2 頁	考試時間 80 分鐘

題目兩頁，共十題，每題十分，總計一百分。作答時題號請標示清楚，並盡量作答，閱卷採部分給分。請不要用鉛筆作答，否則以零分計。

1. Solve the O.D.E.： $t^2y''-3ty'+9y=0$.

2. Find the particular solution of $y'+xy=xy^{-1}$, $y(0)=3$.

3.Find the value of k if two vectors $\begin{bmatrix}4 & 1 & -4 & k\end{bmatrix}$ and $\begin{bmatrix}-1 & 2 & 1 & 1\end{bmatrix}$ are orthogonal.

4. Find the Fourier Transform of $f(x)=e^{-a|x|}$ $(a>0)$.

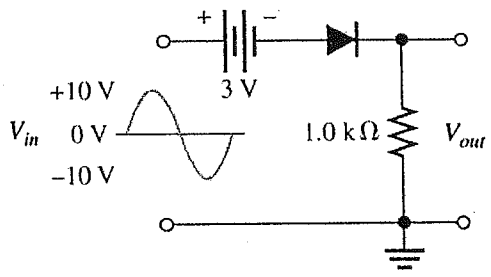
5. Given a matrix $A=\begin{bmatrix}1 & 1 & -4\\ 2 & 0 & -4\\ -1 & 1 & -2\end{bmatrix}$, find the matrix P such that $P^{-1}AP=D$, where

D is a diagonal matrix.

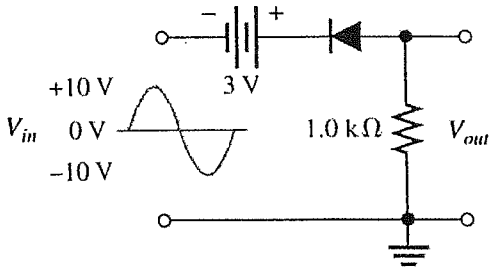
6. How is the electric field across the *pn* junction of semiconductor created?

7. Describe the basic difference between a D-MOSFET and an E-MOSFET.

8. Determine the output voltage waveform for each of the circuits shown:



(a)



(b)

9. Please analyze the circuit of Fig. 1 to determine the voltages at all nodes and the currents through all branches. Assume that V_{BE} is 0.7V when the base-emitter junction is forward biased and the transistor β is 100.

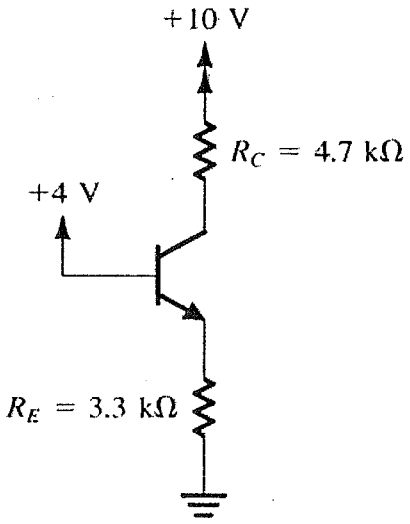


Fig. 1

10. Fig. 2 is an instrumentation amplifier circuit. Please find the output voltage v_o of the circuit in Fig. 2. (Hint：The values of the open-loop gain A_1, A_2, and A_3 are infinite.)

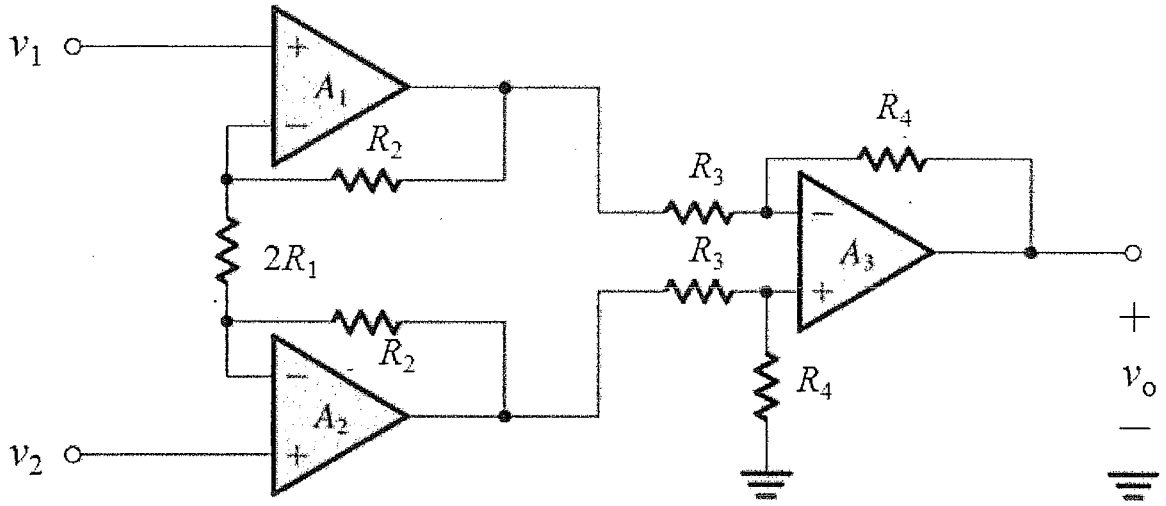


Fig. 2

國防大學理工學院 102 學年度博、碩士班招生 ■博士班□碩士班 考試試題			
系(所)別：國科所資工組	考試科目：基礎學能	第 1 頁，共 1 頁	考試時間：80 分鐘

(A) 線性代數（共 5 題, 每題 10 分, 共計 50 分）

1.Calculate the distance from the point P(1,1,3) to the plane 2x-y+3z=1.

2.Let $A=\begin{bmatrix}1&0\\3&1\\4&0\end{bmatrix}$ and $B=\begin{bmatrix}-1&0\\2&-3\end{bmatrix}$. Please calculate the multiplication A×B.

3.Calculate the volume of the parallelepiped defined by these three vectors: (1,0,1), (-1,1,2), (0,1,3).

4. Find the inverse of the following matrix

$$\begin{bmatrix}1&1&1\\2&3&2\\3&8&2\end{bmatrix}$$

5.Diagonalize the matrix $\begin{bmatrix}1&1&1\\0&0&0\\0&0&0\end{bmatrix}$

(B) 計算機概論(共 5 題, 共計 50 分)

6. Convert the following decimal numbers to radix-7 numbers. (12%)
   (a) 131 (3%)
   (b) 123 (3%)
   (c) 1001 (3%)
   (d) 345.6 (3%)
7. Which memory type is faster: SRAM or DRAM? (8%)
8. Simplify the following Boolean expressions to a minimum number of literals. (10%)
   (a) x'y + xy + xz' + xy'z' + yz' (5%)
   (b) xy' + x (wz + wz') (5%)
9. What is the difference between a thread and a process? (10%)
10. Explain the difference between flow control and congestion control in TCP (Transmission Control Protocol). (10%)

國防大學理工學院102學年度博、碩士班招生■博士班□碩士班 考試試題			
系（所）別：國科所化材組	考試科目：基礎學能(材料科學)	第 1 頁，共 1 頁	考試時間：80 分鐘

一、名詞解釋：(共 5 題，每題 4 分，小計 20 分)

1.stacking fault

2.hardenability

3.hydrogen bond

4.eutectic reaction

5.critical resolved shear stress

二、問答題：(共 10 題，每題 8 分，小計 80 分)

6. 請描述金屬材料於凝固過程中各階段的凝固狀況並以圖示之。

7. 請推導及說明 level rule.

8. 已知純鐵由室溫加熱到 912℃以上時，其結晶結構會由 BCC 轉變為 FCC，試求出此變態過程中之體積變化為何?假設鐵的原子半徑為 0.124 nm。

9. 請計算下列晶體結構其單位晶胞內所含的原子的數量為何: (a) B.C.C. 結構 (3 分), (b) F.C.C. 結構 (3 分), (c) H.C.P. 結構 (2 分)

10. 請說明在晶體材料中含有那些種類的缺陷?

11. 請說明 Hall-Petch 方程式的功用為何?

12. 物質中的原子鍵結型式有那幾種?

13. 請算出(213)和(110)兩平面之 zone axis 為何?

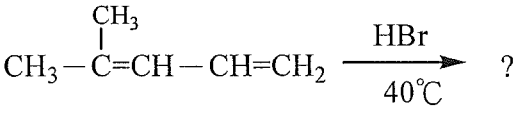
14. 請畫出低碳鋼之應力應變圖，並解釋由圖中可以得到那些重要材料機械性質?

15. 何謂滑移系統?FCC 材料之滑移系統為何?

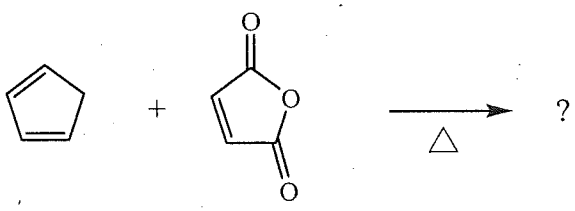
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系（所）別：國科所化材組	考試科目：基礎學能(綜合化學)	第 1 頁，共 4 頁	考試時間：80 分鐘

問答及計算題（共 40 題，每題 2.5 分，合計 100 分）

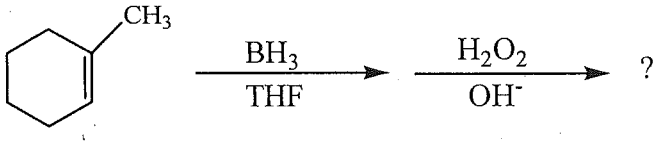
1.Predict the major product of the following reaction.



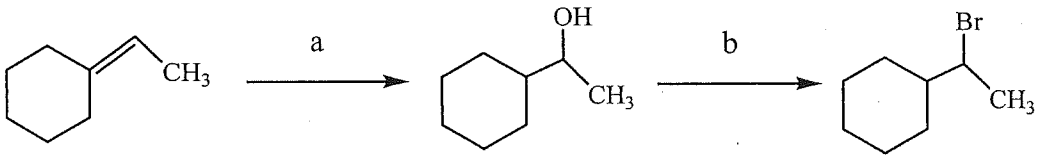
2.What are the products of the following Diels-Alder reactions?



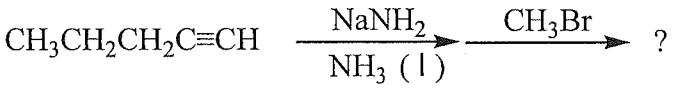
3.Give the structures of the following reactions



4.Identify the reagents a and b in the following scheme:

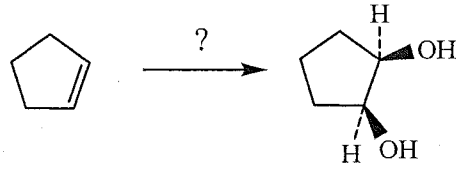


5.What is the final major organic products of the following reactions?

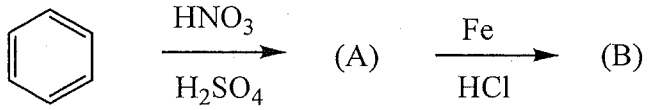


6.How would you carry out the following transformation?

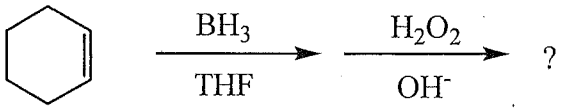
Tell the reagents you would use in each case.



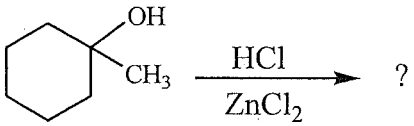
7.Predict the product of each reaction in the following synthesis process:



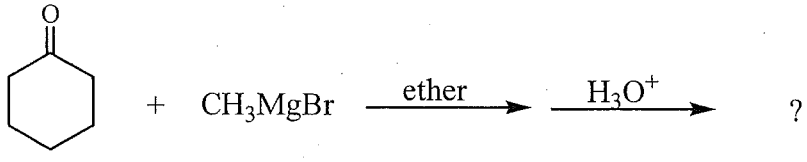
8.Predict the final major organic pooducts of the following reactions:



9.Give the organic product(s) of the reactions shown below.



10.Predict the final products of the following reactions.



11. The total entropy change (ΔS_{sys}) for a cyclic process is zero. Why?

12. Explain the term "Colligative property".

13. Explain the term "first-order phase transition".

14. Explain that why the application of pressure to pure water results to the decrease in its freezing point?

15. What is so called a "superfluid"?

16. Write down the integrated form and differential form of rate equation for a $A \xrightarrow{k} product$ elementary reaction.

17. Relate Gibbs energy change and equilibrium constant of a chemical reaction.

18. Count the degrees of freedom for vibational motion of a nonlinear triatomic molecule.

19. Explain the phenomenon of "tunnelling".

20. Write basic form of the Schrondinger equation.

21. Please describe second and third laws of thermodynamics.

22. What is the least-complex equation of state (EOS)?

23. Write down two items intensive property and two items extensive property

24. What is a state function? Please cite two examples.

25. Explain briefly the difference between steady state and equilibrium.

26.Briefly state the Carnot cycle.

27. What is "Chemical potentials"? Please explain.

28. Briefly state the microscopic view of entropy.

29. How much energy is needed to convert 64.0 grams of ice at 0.00°C to water at 75.0°C?

Specific heat(ice)=2.10 J/g

Specific heat(water)=4.18 J/g

Heat of fusion=333 J/g

Heat of vaporization=2258 J/g

30. The total volume of an ideal gas is 4 L at 0 ℃ and 25 atm. What is total volume for a reversible adiabatic expansion and final pressure is 1 atm? The gas has C_v = 1.2 R and C_p = 2.4 R.

31. Explain the physical meaning for each of the experimental parameters and variables in the Arrhenius equation.

32. For the homogeneous gas phase reaction, $2A + 3B \rightarrow 3C + 5D$, the rate law is $r_A = -k_A C_A C_B^2$. What are the r_C expressed as concentration of A and B?

33. Consider the following rate $R=k[A]^m[B]^n$. How are the exponents m and n determined?

34. For the isothermal gaseous reaction $2\ R \rightarrow 3\ P$, what is the change fraction of volume (ε_R)?

35. Compare the advantages, disadvantages and usages for PFR and CSTR.

36. Briefly describe the three types of catalyst deactivation.

37. The rate of a first order reaction is 0.1 Ms^{-1} if the concentration of reactant is 0.1 M. What is the half-life (in s) of this reaction?

38. Briefly state the shrinking core model.

39. Derive the integrate rate equation for a reaction of 1/2 order.

40. The space time necessary to achieve to 75% conversion in a CSTR is 2 hours. What is the reactor volume required to process 3 ft^3/min for this system?

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系(所)別：國科所機航組	考試科目：基礎學能	第 1 頁，共 3 頁	考試時間 80 分鐘

一、工程數學(計 10 題，每題 5 分，共 50 分)

1. Solve $yy' + xy^2 = x$.

2. Find the solution of following equation.

$$y'' - y' - 2y = 4x^2; \quad y(0) = 1, \quad y'(0) = 4$$

3. Find the eigenvalues and eigenfunctions.

$$y'' + \lambda y = 0, \quad y(0) = 0, \quad y(1) + y'(1) = 0$$

4. Using the Laplace transform, solve the initial value problem.

$$\begin{cases} y_1' = 5y_1 - 4y_2 - 9t^2 + 2t \\ y_2' = 10y_1 - 7y_2 - 17t^2 - 2t \end{cases} ; \quad y_1(0) = 2, \quad y_2(0) = 0$$

5. Given two three-dimensional vectors: $\mathbf{u} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$ and $\mathbf{v} = 4\mathbf{i} + 2\mathbf{j} - \mathbf{k}$.
Please calculate the followings
(a) $\mathbf{u} \times \mathbf{v}$
(b) $\mathbf{v} \times \mathbf{u}$
(c) $\mathbf{u} \times \mathbf{u}$

6. Find the eigenvalues and normalised eigenvectors of the real symmetric matrix.

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 1 & -3 \\ 3 & -3 & -3 \end{bmatrix}$$

7. Given: $x^2 + y^2 + z^2 = 1$, find the surface area of this sphere above $x \geq 0$

8. Expand $f(x) = x \ \ (0 < x < \pi)$ in a sine-cosine Fourier series.

9. Find the type, transform the normal form, and solve.

$$\frac{\partial^2 u}{\partial x^2} + 9\frac{\partial^2 u}{\partial y^2} = 0$$

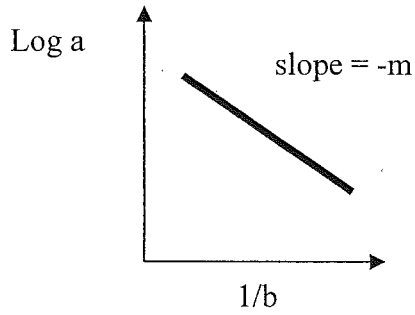
10. Find $\oint_c \frac{\sin z}{z^4} dz$; $c: |z| = 1$

二、普通物理(計 10 題，每題 5 分，共 50 分)

11. 某人在某高樓上以水平速度 v 丟出一顆小石頭，石頭落地後測得其在水平方向移動距離為 d。令重力加速度為 g 且不計空氣阻力，請以一含 v、g、d 之方程式表示樓高 H。

12. 請計算下列數據的有效數字個數，並將此四個數據的有效數字依大至小排列出來。
(a) 1900 (b) 0.0023 (c) 0.240 (d) 1.234×10^{-10}

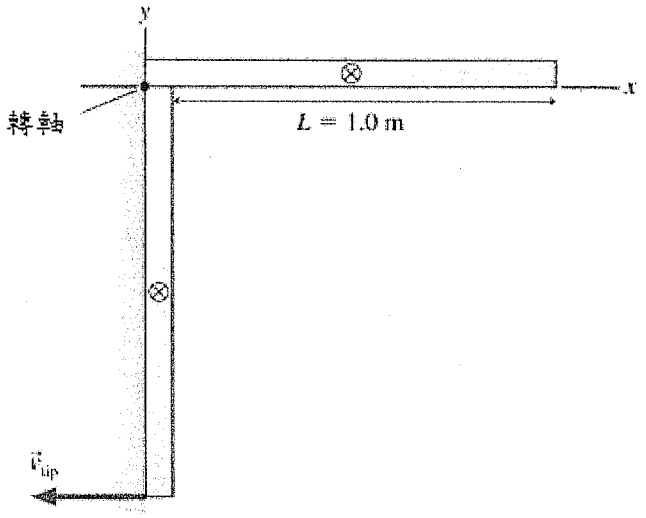
13. 某實驗之結果繪在半對數圖紙上呈現出一斜率為 -m 之直線如下圖所示，請寫出圖中 a 參數與 b 參數的關係方程式 (忽略常數項)。



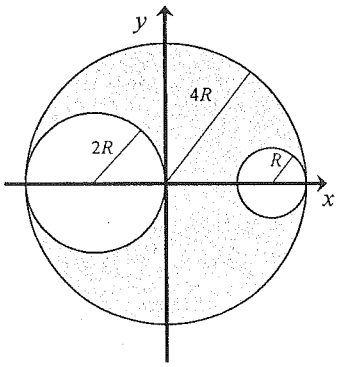
14. 一個電子在 5.0 mT 的磁場下，以 4.0×10^{-26} kg m^2/s 的角動量產生圓周運動，請問此圓周運動的直徑為何？

15. 10 公克的子彈從重 5 公斤的自動步槍中以 300 m/s 的速度射出，請問該步槍產生的後退速率為多少 ？

16. 一根長 1 公尺、100 公克 的均勻木棍其一端邊緣聯結著牆上(如下圖)，當空氣阻力及連結牆上的轉軸磨擦力不計的情形下，木棍由水平釋放(該木棍轉動慣量 $I = ML^2/3$)，當其撞擊牆的一瞬間，木棍邊緣的速率為何 ？

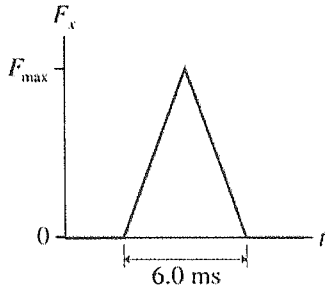


17. 一外徑 4R 的均勻厚度金屬平板，該平板上有兩個半徑分別為 2R 及 R 的洞如下圖所示。利用圖中的 xy 座標系，請問該板的重心座標為何？

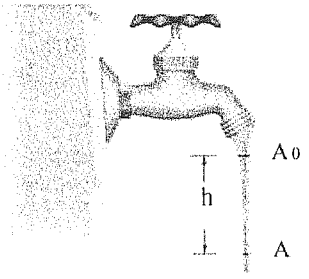


18. 一密度為 5 g/cm^3 的物體沉入密度為 1.5 g/cm^3 的 A 液體中以彈簧秤測得其質量為 7 kg；再將該物體沉入 B 液體中測得其質量為 6.4 kg，試問 B 液體密度為若干？

19. 王建民將質量 100 公克的棒球以時速 150 公里投出，打者打中該球後，該球以時速 300 公里向王建民飛去，球和棒子的交互作用力及作用時間如下圖所示，請問棒子作用在球上的最大力(maximum force F_{max})為何 ？



20. 下圖顯示從水龍頭向下流出水的收縮(neck down)現象，其中二個高度相距 h = 20 cm 的截面，水流截面積分別為 $A_0 = 3$ cm^2 及 $A = 2$ cm^2，假設過程中水的密度不變化，試問水的流量為若干？



工程數學（共計 10 題，每題 5 分，共計 50 分）

1.求解方程式 $y'''-4y'=0$ 之通解(General Solution)

2.求解方程式 $y'''-3y''+3y'-y=0$ 之通解(General Solution)

3.求方程式 $g(t)=t\sin 2t+e^{-2t}$ 之拉氏轉換(Laplace Transform)

4.已知 e^{x} ，e^{2x} 為 $y''-3y'+2y=0$ 通解之基底，且 $\frac{1}{2}e^{3x}$ 為 $y''-3y'+2y=e^{3x}$ 的一個特解，試求 $y''-3y'+2y=e^{3x}$ 之通解

5. 若向量 $\vec{u}=\vec{i}-\vec{j}+\vec{k}$ 與 $\vec{v}=4\vec{i}-a\,\vec{j}-2\vec{k}$ 互相垂直，試求 a 之值

6. 試求方陣 $\mathrm{A}=\begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}$ 之逆矩陣(Inverse Matrix)

7. 求以向量 $\vec{a}=2\vec{i}-\vec{j}-\vec{k}$，$\vec{b}=\vec{j}+7\vec{k}$，$\vec{c}=\vec{i}+2\vec{k}$ 所構成的六面體體積?

8. 有一空間曲線 $\vec{r}(t)=t^2\vec{i}+5\vec{j}+t^2\vec{k}$ ，試求 $t\in[0,1]$ 之弧長

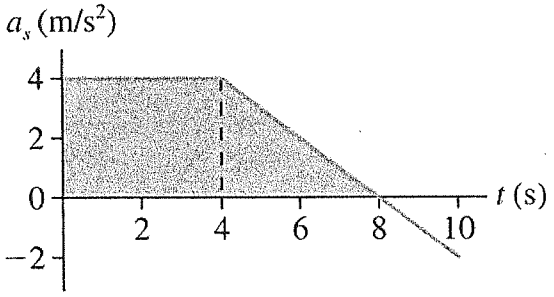
9. 函數 $f=\ln(x+y^2+z^3)$，試求從點 $\mathrm{P_0}$(-1,1,2)到 $\mathrm{P_1}$(-1,2,3)的方向導數 (Directional Derivative)

10. 試求下列週期函數之最小週期 $f(t)=\sum_{n=1}^{\infty}\cos\frac{n\pi t}{\ell}$

普通物理（共計 10 題，每題 5 分，共計 50 分）

11.若您每天平均使用您的 120 V，1.5A 的筆記型電腦 4 個小時，若目前台電的收費是每度（kWh）4.0 元，請問您每個月（以 30 天計）花在電腦上的電費是多少元？

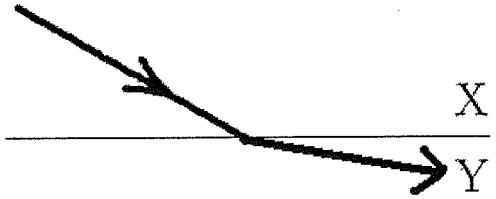
12. 下圖為某一質點的加速度和時間的對應圖，該質點初速為 10 m/s 請問 t = 4 s 時，質點的速度為多少 ？



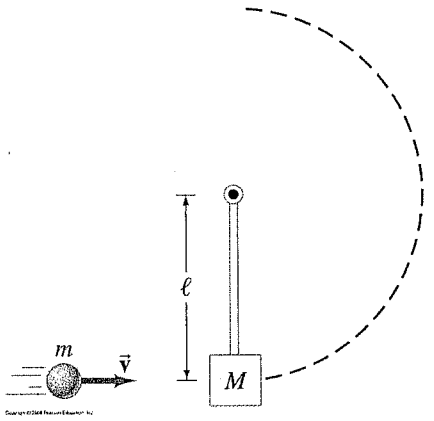
13.一行進波在某介質上行進，介質之位移方程式為 $y(x,t)=3\sin(2x+60t)$，其中 y 及 x 單位為 m；t 單位為 s，則波之波速、週期、波長、波數(wave number)分別為何？

14.電梯馬達以 50 秒將 500 kg 的電梯以等速率垂直向上舉升 500 m，請問需要多少功率(watt)？

15.如下圖所示為一光線通過材料 X 進入材料 Y 之情形，則此光線進入材料 Y 後之傳播速率、頻率、波長之變化為何？



16.單擺擺垂質量為 M，吊掛在無質量但長度為 L 之木桿上，如下圖。此時有一質量 m、速度 v 之質點撞擊靜止的擺垂 M 後埋入其中。如撞擊後擺垂能擺動至最高點，問 v 之最小值若干？(忽略摩擦力)



17.假設金門在台中的正西方外海 100 公里處，一架無人飛機以相對於空氣 40 km/hr 的速度向正西方飛行，由於駕駛員忘了查看天氣，他不知道當時環境大氣正以 10 km/hr 吹北風，請問此時飛機相對於地面的速度為何?

18.承上題，請問飛行 2 小時後，該飛機位於金門的什麼方位(需說明方向並計算角度)？距離多遠？

19. 一質點時間 $t = 0$ 時從原點出發並以初速度 4.0 m/s 往正 x 軸運動，其加速度方程式為 $-4.0\hat{i}+4.0\hat{j}$ (m/s^2)，問當其抵達最大 x 座標點時之位置在何處？

20. 一位歌手在時速 90 km/hr 的敞篷車上，以 600 Hz 的聲音唱歌，請問位於其車輛前方遠處的人，見其快速駛來時，聽到的頻率為何？（聲速 343 m/s）

Vocabulary 20% (each 2%) For questions 1~10, choose the best answer to complete each sentence. 字彙測驗：共十題，每題二分，共二十分。

1. Because of the _____ of papers in his office, he did not have any place to sit down.
   (A) submergence (B) frustration (C) complacency (D) accumulation

2. After breaking off the relationship with his girl friend, John could talk about her with an air of _____ because he didn't have feelings for her anymore.
   (A) detachment (B) excitement (C) commitment (D) increment

3. Tree bark provides deer with _____ in periods of drought.
   (A) agitation (B) sustenance (C) assimilation (D) perseverance

4. This action was undoubtedly in _____ for last week's bomb attack.
   (A) amends (B) retaliation (C) interpretation (D) pilgrimages

5. Sales increased last year despite the _____ economic environment.
   (A) hostile (B) hospitable (C) preferential (D) initiative

6. Martin has always been _____, that is, certain about who he is and what he wants.
   (A) self-discipline (B) selfishness (C) self-assured (D) self-indulgence

7. To get a better profit, the good idea of setting up his own company began to _____ in his own mind.
   (A) prohibit (B) deteriorate (C) germinate (D) eradicate

8. Several patients were waiting to be _____ a bed.
   (A) outraged (B) fluctuated (C) congested (D) allocated

9. He was found guilty of indecently _____ a student.
   (A) ruminating (B) plaguing (C) substituting (D) assaulting

10. Many people heard police _____ in the distance last night.
    (A) procedural (B) sirens (C) scanner (D) court

Grammar 20% (each 2%) For questions 11~20, choose the best answer for each blank.
文法測驗：共十題，每題二分，共二十分。

11. This apron has no pocket _____.
(A) putting things in (B) to be things put (C) to put things in (D) to put thing

12. _____ around stones that are sun-warmed, even the smallest of stones creates tiny currents of warm air.
(A) That the air cools (B) The cool air (C) If the air is cool (D) The cooler the air

13. Despite its wide ranges of styles and instrumentation, country music has certain common features _____ its own special character.
(A) gives that (B) give it that (C) that give it (D) that gives it to

14. Most of _____ archaeologists know about prehistoric cultures is based on studies of material remains.
(A) their (B) which (C) these (D) what

15. Hubble's law states that the greater the distance between any two galaxies, _____ is their relative speed of separation.
(A) as great as (B) the greatest (C) the greater (D) greater than

16. Relative humidity is the amount of water vapor the air contains a certain temperature ____ with the amount it could hold at that temperature.
(A) compares (B) comparing (C) compared (D) to compare

17. Margret Brent, because of her skill in managing estates, became _____ largest landholders in colonial Maryland.
(A) who the (B) the one that (C) one of the (D) what the

18. _____ a major role in future planetary exploration.
(A) Robots, which will surely play (B) Robots will surely play
(C) Surely Robots, which will be playing (D) Because robots will surely be playing

19. _____ touching in O. Henry's stories is the gallantry with which ordinary people struggle to maintain their dignity.
(A) It most is (B) Is it most (C) Most is (D) What is most

20. Social scientists believe that _____ from sounds such as grunts and barks made by early ancestors of human beings.
(A) language which, was very slow to develop
(B) language, very slow developing
(C) language developed very slow
(D) the very slow development of language

Reading Comprehension 20% (each 2%) For questions 21~30, choose the best answer for each question. 閱讀測驗：共十題，每題二分，共二十分。

When the explorer comes home victorious, everyone goes out to cheer him. We are all proud of his achievement — proud on behalf of the nation and of humanity. We think it is a new feather in our cap, and one we have come by cheaply. How many of those who join in the cheering were there when the expedition was fitting out, when it was short of bare necessities, when support and assistance were most urgently wanted? Was there then any race to be first? At such a time the leader has usually found himself almost alone; too often he has had to confess that his greatest difficulties were those he had to overcome at home before he could set sail. So it was with Columbus, and so it has been with many since his time. Amundsen has always reached the goal he has aimed at, this man who sailed his little yacht over the Arctic Ocean, round the north of America, on the course that had been sought in vain for four hundred years. So, when in 1910 he left the fjord on his expedition in the Fram, to drift right across the North Polar Sea, would it not have been natural if we had been proud to support such a man? But was it so? For a long time he struggled to complete his equipment. Money was still lacking, and little interest was shown in him and his work. He himself gave everything he possessed in the world. But nevertheless had to put to sea loaded with anxieties and debts, as he sailed out quietly on a summer night. (Adapted from the introduction by Fridtj of Nansen to *The South Pole*, R Amundsen 1912)

21. The 'feather in our cap' refers to _____.
(A) way we respond to all success
(B) our willingness to take unearned credit for a triumph
(C) the pride we have in being human
(D) our sense of having got a reward for our investment

22. The 'race to be first' refers ironically to the _____.
(A) lack of response to urgent appeals for help
(B) willingness to give credit
(C) rush to laud the explorer
(D) eagerness of the explorer to be alone

23. From both paragraphs taken together, it appears that Amundsen and Columbus shared all of the following except the fact that they _____.
(A) had difficulties to face apart from those they faced on their expeditions
(B) sailed the seas alone
(C) were not always supported when they most needed it
(D) achieved feats that should have received accolades

Since the late 1950's an interest in hot-air ballooning as a sport has increased mainly because the output of labor necessary to inflate balloons has decreased, and because propane has been found to be more efficient and economical. The hot-air balloon actually consists of a pair shaped balloon made from approximately 1,300 square yards of synthetic fabric from which an enclosure resembling a basket for a crew of one or two is suspended. Two twenty-gallon propane tanks are attached to the basket and a burner is situated on a platform above the pilot's head. The dimensions are sixty-five feet tall by fifty-five feet across. Up and down control of the balloon's flight path is accomplished by valves that regulate the amount of propane flowing from the tanks to the burner, but the main lift is caused by the temperature difference between the air inside the balloon directional control capability and must drift with the wind. Pilots, therefore, try to maintain a flight altitude at which winds will carry them in a planned direction. Although there are many hot-air balloon enthusiasts throughout the United States, Arizona, because of its moderate temperatures, wide open spaces and calm winds, attracts many hot-air balloon crews and spectators from November through April. Spectators are fascinated with the variety of balloon shapes that have been designed recently. In addition to the traditional pair shaped balloons, there are animal and cartoon character designs. The colors are so carried and bright that when the balloons are ready to lift off, the ground appears to be covered with blossoming flowers. Then there is joy and excitement as the beautiful colors rise into the sky.

24. Once airborne, how do pilots control the balloon's other than up and down movements?
(A) Different temperature (B) Drift with the wind
(C) Control capability (D) Maintain a flight altitude

25. What makes the balloons appear to be blossoming flowers?

(A) Arizona temperature (B) Calm winds

(C) Varied colors (D) Open spaces

The Clarion City Council will hold a meeting this week to discuss the proposal to build a tunnel under the Central River. The tunnel would not replace the existing bridge but would relieve traffic congestion on the roads that link downtown Clarion to suburbs on the south side of the river. Yanco Builders, seen as the firm likely to be given the building contract, has been working with council members ever since preliminary studies of the tunnel project began. A spokesperson for Yanco, Danald Young, stated, "This tunnel will have tremendous impact on the people of Clarion. Traffic conditions will improve; noise pollution will be reduced, and the struggling downtown shops and restaurants will see a growth in business. If people in the suburbs can get downtown more easily, they will go there for their shopping and entertainment." Some opponents of the tunnel project question whether the tunnel will actually reduce traffic jams. A citizens group calling itself Responsible Traffic Solutions (RTS) has been pushing for a temporary delay in the project so that further studies can be conducted. RTS, which has requested a meeting with city council members, believes that the city's shortage of public transportation might be a more important issue to address when considering how to reduce traffic on the bridge. The group has also expressed concern over the loss of green space along the river. Says an RTS spokesperson, "To take away the little green space the city would be harmful to plants and animal species that live along the southern edge of the city and would take away from the natural charm of the area.

26. What is true about the city council?

(A) It has voted to approve the tunnel project.

(B) It has met with the leaders of RTS.

(C) It plans to build more shops and restaurants.

(D) Its has been working with Yanco Builders.

27. What did Mr. Young say about the tunnel project?

(A) It will be completed later than expected.

(B) It will replace the existing bridge.

(C) It will be good for the downtown economy.

(D) It will create more jobs in the suburbs.

28. Why has RTS asked that the project be delayed?
(A) It wants citizens to vote on the project.
(B) It wants a different company to build the tunnel.
(C) It wants more studies to be done.
(D) It wants to extend the tunnel to a neighboring town.

29. What is not stated about the city of Clarion?
(A) Its green space is very limited.
(B) Its public transportation system is insufficient.
(C) Traffic is a problem between downtown and the suburbs.
(D) Its shops have recently seen a growth in business.

30. Which of the following word matches the meaning --"somebody who is against something and tries to change or stop it"--in the reading?
(A) proposal (B) contract (C) impact (D) opponent

Translation and Short Composition [翻譯與短篇作文] (40%):

(a) Translate the following questions from English into Chinese and then
(b) answer them **in English with at least 100 English words.**.
(請將 31. 32 問句先 (a)**翻成中文** 然後 (b)**用英文回答之**，文長至少 100 個英文單字。)

31. Steve Jobs once said, "Your time is limited, so don't waste it living someone else's life."

31a. Translate Item 31 from English to Chinese (英翻中) (5%)

31b. **Write your opinions at least 100 English words** (用英文回答**第31題，文長至少100個英文單詞**) (15%)

32. If everybody else is doing it one way, there's a good chance you can find your niche by going in exactly the opposite direction.

32a. Translate Item 32 from English to Chinese (英翻中) (5%)

33b. **Illustrate some examples at least 100 English words** (用英文回答**第32題，文長至少100個英文單詞**) (15%)