

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

科目名稱：工程英文【機電系碩士班丁組】

題號：438001

※本科目依簡章規定「不可以」使用計算機

共 2 頁第 1 頁

I、閱讀測驗(第 1 至 11 題，每題 3 分，共 33 分)

說明：請閱讀下列文章，然後根據文章之文意回答下列問題，並寫在答案紙上，可以中文或英文回答。

Directions: Read a journal abstract below, and then answer the following questions by writing your answers onto the answer sheets.

Friction stir welding for transportation industries

W. M. Thomas, E. D. Nicholas

TWI, Abington Hall, Abington, Cambridge CB1 6AL, UK

Materials & Design, Vol. 18, No. 4 (1997) 269-273

This paper will focus on the relatively new joining technology – friction stir welding (FSW). Like all friction welding variants, the FSW process is carried out in the solid-phase. Generally, solid-phase welding is one of the oldest forms of metallurgical joining processes known to man. Friction stir welding is a continuous hot shear autogenous process involving a non-consumable rotating probe of harder material than the substrate itself. In addition, FSW produces solid-phase, low distortion, good appearance welds at relatively low cost. Essentially, a portion of a specially shape rotating tool is plunged between the abutting faces of the joint. Once entered into the weld, relative motion between the rotating tool and the substrate generates frictional heat that creates a plasticized region around the immersed portion of the tool. The contacting surface of the shouldered region provides additional friction treatment to the weld region as well as preventing plasticized material being expelled. The tool is then translated with respect to the workpiece along joint line, with the plasticized material coalescing behind the tool to form a solid-phase joint as the tool moves forward. Although the workpiece does heat up during FSW, the temperature does not reach the melting point. Friction stir welding can be used to join most aluminum alloys, and surface oxide presents no difficulty to the process. Trials undertaken up to the present time show that a number of lightweight materials suitable for the automotive, rail, marine, and aerospace transportation industries can be fabricated by FSW.

1. In which journal was this paper published?
2. When was this paper published?
3. Who wrote this article? State Only family names.
4. Indicate some of the advantages of FSW.
5. What are transportation industries?
6. What is the meaning of the term “solid-phase welding”?
7. What is the meaning of the term “a non-consumable rotating probe”?
8. What is the meaning of “creates a plasticized region”?
9. What is the meaning of the word “plunged”?
10. What is the meaning of the term “abutting faces”?
11. What is the meaning of the term “surface oxide”?

II、英翻中(共 17 分)

12. Forging is a process in which the workpiece is shaped by compressive forces applied through various dies and tools. It is one of the oldest metalworking operations, dating back at least to 4000 B. C. – perhaps as far back as 8000 B. C. Forging was first used to make jewelry, coins, and various

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implements by hammering metal with tools made of stone. Simple forging operations can be performed with a heavy hand hammer and an anvil, as was traditionally done by blacksmiths. Most forgings, however, require a set of dies and such equipment as a press or a forging hammer.

III、中翻英（每題 5 分，共 50 分）

13. 在工業上使用的銲接有許多的種類。
14. 鑄造是用在生產形狀較複雜的工件。
15. 最佳設計常常需要用到微分的方法。
16. 優良產品設計的核心在創造性思維。
17. 若與鐵相比鋼的許多機械特性較佳。
18. 學生常搞混材料的強度和應力應變。
19. 在機動學我們學習連桿凸輪與齒輪。
20. 四連桿組是種容易的單自由度機構。
21. 當有組合件時公差的設定更為重要。
22. 現今工程圖的製作已多是電腦化了。

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科目名稱：工程數學【機電系碩士班甲組、乙組、丙組】

題號：438002

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共 1 頁第 1 頁

I. (35%)

1. (10%) Find all solutions or indicate that no solution exists.

$$4y + z = 0$$

$$12x - 5y - 3z = 34$$

$$-6x + 4z = 8$$

2. (15%) Find the eigenvalues and the corresponding eigenvectors. Use the given λ .

$$\begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}, \lambda=4$$

3. (10%) Experiments show that in a temperature field, heat flows in the direction of maximum decrease of temperature T . Find this direction in general and at the given point P.

$$T = \frac{z}{x^2 + y^2}, P: (0, 1, 2)$$

II. (35%)

1. Solve the following ordinary differential equations (ODEs):

(a) (10%) $(1 - 2x - x^2)y'' + 2(1 + x)y' - 2y = 0$

(b) (13%) $2xy'' + (1 + x)y' + y = 0$

(c) (12%) $y'' + 3y' + 2y = \begin{cases} 0, & \text{if } t < 1 \\ 1, & \text{if } 1 < t < 2 \\ 0, & \text{if } t > 2 \end{cases}$ with I.C.: $\begin{cases} y(1) = 1 \\ y'(1) = -1 \end{cases}$

III. (30%)

1. Please answer the following questions:

(a) (5%) What is "Fourier series" used for?

(b) (5%) What is "orthogonality" regarding the Fourier series?

(c) (10%) Please find the Fourier series according to the following periodic rectangular wave:

$$F(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}, k \text{ is a constant}$$

2. (10%) What is "partial differential equation (P.D.E)"? Please give an example. (You don't have to solve the P.D.E in your example.)

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科目名稱：自動控制【機電系碩士班丙組】

題號：438003

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1. (10%) The forward-path transfer functions of a unit-feedback control system are given in the following:

$$(a) G_1(s) = \frac{K(s+0.5)}{s^2(s+4)} \quad (b) G_2(s) = \frac{K(s-2)}{s(s+2)(s^2+5s+25)}$$

Construct the root loci for $K > 0$.

2. (20%) Obtain the closed loop transfer function $\theta_o(s)/\theta_i(s)$ of the system shown in Fig. 1. Find the range of K required for stability. Also find the gain K required for 25% overshoot.

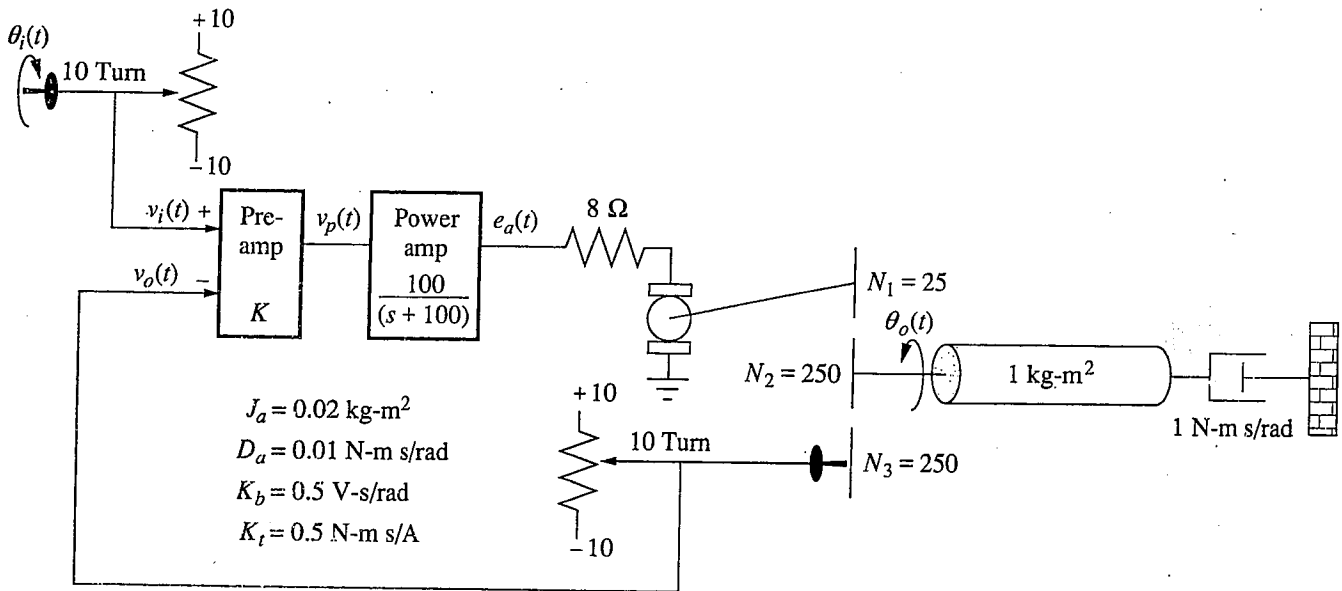


Fig. 1

3. (20%) In Fig. 2, let $G_p(s) = \frac{4}{s^2}$ and $G_c(s) = K_p + K_d s$.

- (a) Find the values of K_p and K_d so that the roots of the characteristic equation correspond to a relative damping ratio of 0.707 and $\omega_n = 1$ rad/sec. Plot the unit-step response and find the maximum overshoot.
- (b) Find the values of K_p and K_d so that the overshoot is zero and the rise time is less than 0.06 sec.

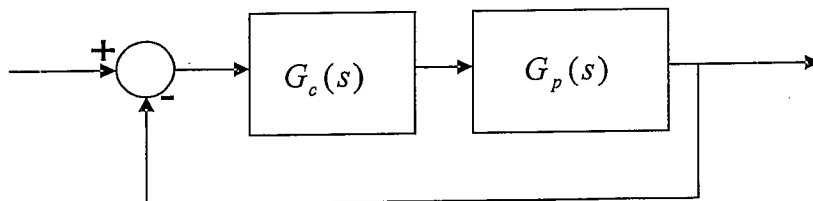


Fig. 2

4. (20%) Let $G_1(s) = \frac{1}{s+1}$ and $G_2(s) = \frac{1}{s+2}$ represent the transfer functions of two control systems.

- (a) Which system has faster speed of response? Why?
- (b) Which system has larger bandwidth? Why?
- (c) Which system has smaller overshoot? Why?
- (d) What is the steady-state response of G_1 if its input is $\cos(2t)$?

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5. (30%) For the system shown in Fig. 2, here we assume that $G_p(s) = \frac{4}{s^2 + 1.4s + 1}$ and $G_c(s) = K_p$.
- (a) What will happen to the phase margin of the closed-loop system if we increase K_p ?
 - (b) What will happen to the bandwidth of the closed-loop system if we increase K_p ?
 - (c) What will happen to the time constant of the closed-loop system if we increase K_p ?
 - (d) What will happen to the maximum value of the closed-loop system frequency response if we increase K_p ?
 - (e) What will happen to the resonant frequency of the closed-loop system frequency response if we increase K_p ?
 - (f) Can the closed-loop system become unstable if K_p is excessively large? Why or why not?

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1. 50% The limit of total words for the following two problems is 200 words. Please answer in English and write on the answering sheets. There are no points, if answer in Chinese.

A. 25%

Please write in English (a) to plot the conventional and true stress-strain diagrams for ductile material (mild steel) (not to scale) and mark the feature points in stress and strain axes 5%, (b) to describe and explain how to obtain these diagrams 10% and (c) to state the difference between conventional and true stress-strain diagrams 10%.

B. 25%

Please write in English (a) to state clearly under what two conditions is the principle of superposition to be applied validly 10% and (b) why the torsion formula in Mechanics of Materials can only be applied to the solid and tubular shafts, i.e., can't be applied to noncircular cross-sections 5% and (c) for what purposes do we need to plot the shear and moment diagrams 10%?

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2. (Total: 50%)

Please completely fill out the following crossword puzzle.

1. [2%]

As vector quantity which is the length of the shortest path connecting the point where a body starts to move and the point where the body finally reaches.

2. [2%]

If the total kinetic energy of a system conserves in a collision, the collision is said to be []. It is a physical property of materials which return to their original shape after they are deformed.

3. [2%]

When an object is acted on by more than one force, the combined force that causes the object to accelerate is referred to [] force.

4. [2%]

It arises whenever an object slides or tends to slide over another object.

5. [2%]

[] = force in the direction of displacement x displacement

6. [2%]

The tendency of a body to maintain its state of rest or constant speed along a straight line.

7. [2%]

A [] diagram shows all the forces acting on an object.

8. [2%]

The [] in a string is called tension.

9. [2%]

The rate at which energy is transferred or work is done.

10. [2%]

When an object's speed increases, its [] energy increases as well.

11. [2%]

The rate of change in position (or displacement).

12. [2%]

The length of the path you traveled.

13. [2%]

When you lift a box up, the box will gain gravitational [] energy.

14. [4%]

$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$; this is the formula for the law of [] of []

15. [2%]

The resistance or inertia to change a body's state of rest or uniform motion is positively related to the body's []

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16. [2%]

The scientist who proposed the three laws of motion; his name is adopted as the unit of force.

17. [2%]

Without other force, an object that is thrown in the air falls because it is under the [] of the Earth.

18. [2%]

Overall displacement over total time taken is equal to [] velocity.

19. [2%]

During free fall, an object attains the [] speed when it stops accelerating and falls with a constant speed.

20. [2%]

The quantity that requires both magnitude and direction for a complete description.

21. [2%]

The quantity that can be described by magnitude only.

22. [2%]

The rate of change of velocity.

23. [2%]

The SI unit for speed.

24. [2%]

The runway is said to be friction-[] if a trolley moves down it at a constant speed when given a sharp push.

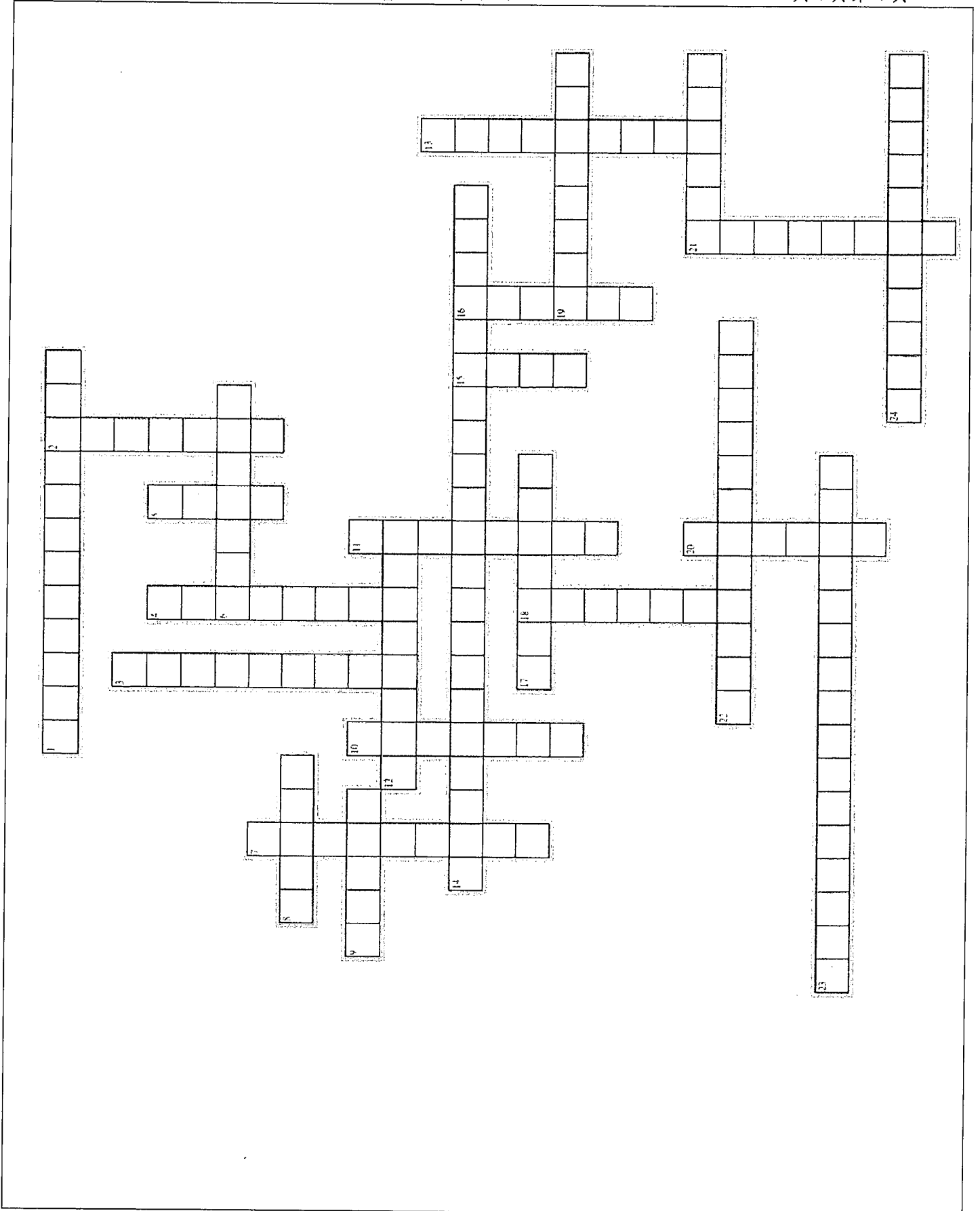
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科目名稱：熱力及熱傳導、熱輻射學【機電系碩士班甲組】

題號：438005

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1. **10%**. An ideal gas within a piston expands from the same initial state to the same final (specific) volume undergoes the adiabatic, isothermal, and isobaric processes, respectively. Please plot a p-v diagram to show the three processes, and show what process the work is done greatest and what process the work is done least. If the three processes occur in a gas turbine, please plot a p-v diagram to show the three processes occurs in a gas turbine and also discuss the work done from the greatest to the least. Assume the ideal gas with constant specific heats at room temperature.
2. **10%**. Please illustrate the meanings and working principles of a cogeneration, a combined gas-vapor power cycle, and a binary power cycle, respectively?
3. **15%**. A six-cylinder, four-stroke, spark-ignition engine operating on the ideal Otto cycle takes in air at 95 kPa and 17°C, and is limited to a maximum cycle temperature of 870°C. Each cylinder has a bore of 8.9 cm, and each piston has a stroke of 9.9 cm. The minimum enclosed volume is 14 percent of the maximum enclosed volume. How much power will this engine produce when operated at 2500 rpm? Use constant specific heats at room temperature. (The properties of air are $k=1.4$, $R=0.287 \text{ kPa} \cdot \text{m}^3/\text{kg} \cdot \text{K}$, $c_p=1.005 \text{ kJ/kg} \cdot \text{K}$, and $c_v=0.718 \text{ kJ/kg} \cdot \text{K}$.)
4. **15%**. A certain gas obeys the equation of state

$$v = RT/P - a/T + b$$

where R is a gas constant, and a and b are also constants. Use this equation of state to derive an equation for the Joule-Thomson coefficient inversion line ($\mu_J = 0$). Please plot its P-T diagram and show several lines for constant h and the inversion line. [Note Joule-Thomson coefficient $\mu_J = (\partial T / \partial P)_h$]

5. **10 %**. A nozzle receives $\dot{m} = 0.5 \text{ kg/s}$ of air at a pressure P_1 of 2700 kPa and a velocity v_1 of 30 m/s and with enthalpy h_1 of 923 kJ/kg, and the air leaves at a pressure P_2 of 700 kPa and with an enthalpy h_2 of 666 kJ/kg.
You could use the following assumptions:
 1. The flow rate is steady.
 2. The work crossing the control volume is zero.
 3. The change in potential energy from inlet to outlet can be neglected.
 (a). **(3%)** To form an energy balance by 2nd Law to calculate the exit velocity v_2 , the mass flow rate and pressures given at inlet (state 1) and outlet (state 2) in this problem will be absent in the equation. Why?
 (b). **(7%)** Determine the exit velocity v_2 from the nozzle for flow where the heat loss q is 1.3 kJ/kg.

Hint: For (b), please derive the governing equation with the symbols listed in this question, and then insert numbers into the equation to calculate the exit velocity at the next step. The score will be partially given based on correctness of the equation you list even if the final solution is wrong.

6. **20 %**. There are two rods exposed to ambient air separately. The only difference between two rods is the length. Rod I has length $L=300 \text{ mm}$, and Rod II is 100 mm. Except the length, the diameter, the base temperature (T_b), material properties (conductivity k) and flow conditions (convection heat transfer coefficient h) are identical. The diameters are 5 mm with one end maintained at $T_b=100^\circ\text{C}$. The surfaces of the rods are both exposed to ambient air at $T_\infty=25^\circ\text{C}$ with a constant convection heat transfer coefficient $h=100 \text{ W/m}^2\cdot\text{K}$. The conductivity k for both rods is $398 \text{ W/m}\cdot\text{K}$.
 - (a). **(5%)** Please derive the governing equation:

$$\frac{d^2T}{dx^2} - m^2(T - T_\infty) = 0$$

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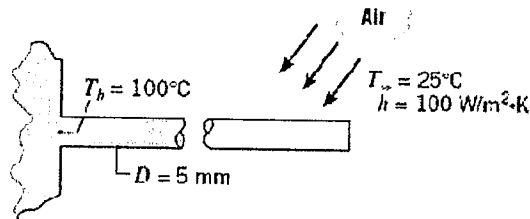
Where $m^2 = hP/kA_c$ with P as perimeter and A_c as cross-section area

(b).(2%) Table listed below shows the temperature distribution based on different tip boundary conditions (Case A and B) at one end. Based on the governing equation in (a), only one boundary condition is not sufficient to solve the equation. Please write down the remaining boundary condition.

(c).(5%) Find the tip temperature at $x=300 \text{ mm}$ for Rod I for Case A and B.

(d).(5%) Find the tip temperature at $x=100 \text{ mm}$ for Rod II for Case A and B.

(e).(3%) The answers for (c) are all very similar while those for (d) are very different. Please make comments on this aspect.



Temperature distribution and heat loss for fins of uniform cross section

Case	Tip Condition ($x = L$)	Temperature Distribution θ/θ_b
A	Convection heat transfer: $h\theta(L) = -k d\theta/dx _{x=L}$	$\frac{\cosh m(L-x) + (h/mk) \sinh m(L-x)}{\cosh mL + (h/mk) \sinh mL}$
B	Infinite fin ($L \rightarrow \infty$): $\theta(L) = 0$	e^{-mx}

$\theta \equiv T - T_\infty$ $m^2 \equiv hP/kA_c$
 $\theta_b = \theta(0) = T_b - T_\infty$ $M \equiv \sqrt{hPkA_c} \theta_b$

Hint: $\sinh x = (e^x - e^{-x})/2$, $\cosh x = (e^x + e^{-x})/2$

7. 20%. Consider a solid material has V as volume, A as surface area, ρ as density, c as heat capacity, k as conductivity. It is enclosed in a room with wall temperature T_{surf} and air temperature T_∞ . You may also need the following coefficient: emissivity ε , absorptivity α , Boltzmann constant σ , and convection heat transfer coefficient h .

(a).(2%) Temperature T is in general function of space and time. However, the spatial effect sometimes can be dropped. In other words, the governing equation can be derived based on the balance of storage energy and surface heat flux. Please explain when you could consider temperature as function of time t only.

(b).(5%) Assume the surrounding is much larger than the solid material. Please write down the net rate of radiation heat transfer from the surface.

(c).(2%) Please write down the form for radiation heat transfer coefficient h_r .

(d).(8%) Derive an ordinary differential equation for T with respect to time t . Will the shape of the solid material affect the heat transfer process if V and A are fixed? Why?

(e).(3%) If the goal is to heat the solid material from initial temperature T_1 to final temperature T_2 , please write down a criteria regarding when the convection can be dropped compared with radiation.

Hint: your answer for (d) will be $dT/dt = \text{convection term} + \text{radiation term}$

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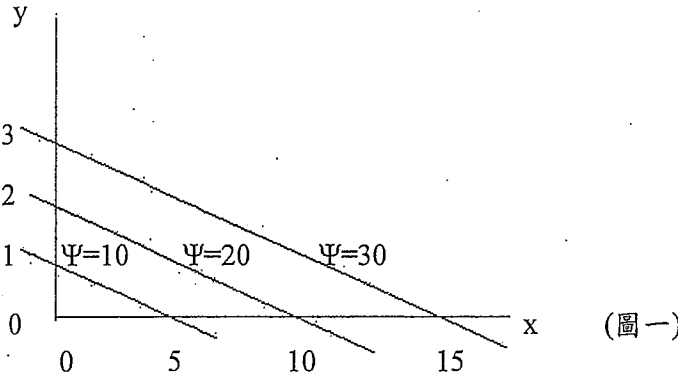
科目名稱：流體力學及熱對流【機電系碩士班甲組】

題號：438006

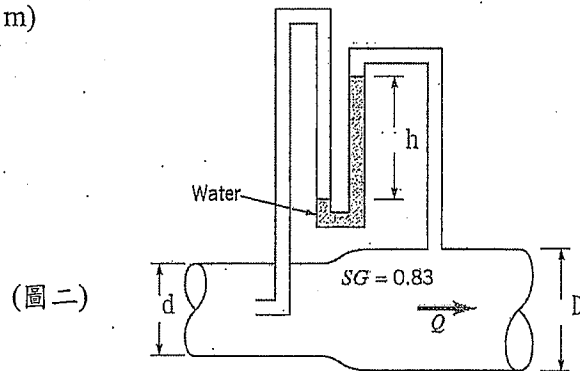
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- (6 分) (a) 何謂牛頓流體(Newtonian fluid) (3 分)? (b) 寫出 Reynolds number 的定義。其物理意義為何? (3 分)
- (6 分) (a) 寫出 Navier-Stokes equation 之向量式 (2 分)。 (b) 寫出 Navier-Stokes equation 在 Cartesian coordinate 中 y -分量的式子 (2 分)。 (c) Navier-Stokes equation 適用的條件為何? (2 分)
- (6 分) 一個 2-D, steady, incompressible 之流場若定義 $u = \frac{\partial \psi}{\partial y}$, 則下圖(圖一)所顯示的 streamline 之流場其 (a) 速度向量值 $\vec{V} = ?$ (3 分), (b) 單位面積的體積流率 $= ?$ (3 分) Ψ 為 stream function。



- (6 分) (a) Define Darcy friction factor (f) (3 分). (b) What is the loss head (h_L) in terms of f , tube length (l/D), and velocity head, for a fully developed flow in a horizontal tube? (3 分)
- (6 分) 如果流場為 $\vec{V} = xy\vec{i} + 2x^2\vec{j} + 3\vec{k}$, 則該流場為 (a) steady or unsteady? (2 分) 寫出理由否則不計分。 (b) 加速度場為何? (4 分)
- (8 分) Oil of specific gravity 0.83 flows in the pipe shown in the Figure 2 (圖二). If viscous effects are neglected, what is the flow rate Q ? ($h = D = 0.1016$ m, $d = 0.0762$ m)



- (12 分) (a) An incompressible, viscous fluid flows between horizontal, infinite, parallel plates as shown below (圖三). The two plates move in opposite directions with constant velocities, U_1 and U_2 , in the directions shown in the figure. Assume the flow is steady and fully-developed. 請從完整的 2-D Navier-Stokes equations 開始, 刪掉可刪掉的項, 並說明可刪掉的原因(一般壓力梯度不為零, 不可刪掉)。導出這個問題的 governing equation。寫出 boundary conditions。說明為何 x 方向之壓力梯度為 constant。解出含壓力梯度的速度場。(10 分)
(b) 當壓力梯度為零時, 速度場為何? (2 分) 註: 使用圖三上的座標($y = 0$ 在下板)

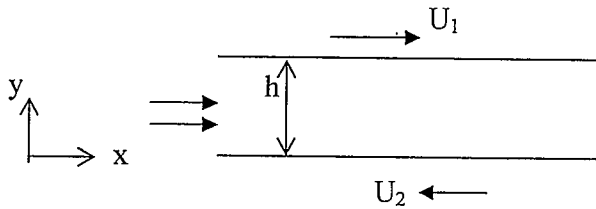
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題號：438006

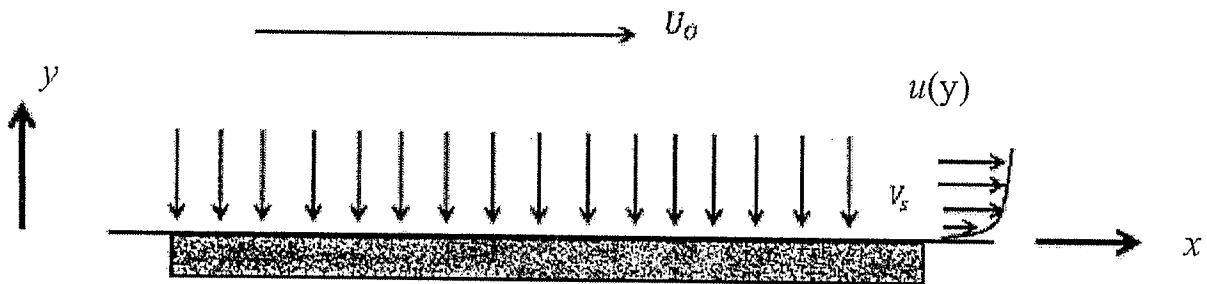
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(圖三)

8. (15 分) A laminar boundary layer on a flat porous plate can reach a constant asymptotic boundary layer thickness and profile shape if suction is applied. Consider the case where the flow is steady and developed (no variation in the stream-wise direction). The velocity components of the flow are u and v . The velocity far from the surface is U_0 . The velocity of the fluid passing into the plate is V_s (With $V_s < 0$). Assume that $u = 0$ on the plate surface. 參考圖四



(圖四)

- (a) Simplify the 2-dimensional continuity equation to show that $u = u(y)$ and $v = V_s$.

Hint: $\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \mathbf{u}) = 0$, where \mathbf{u} is the flow velocity vector field.

- (b) Simplify the 2-dimensional Navier-Stokes equations with Newtonian viscous stress to derive a differential equation relating $u(y)$, U_0 , and V_s (ρ and μ are the fluid density and viscosity).

Hint: $\rho \left(\frac{\partial \mathbf{u}}{\partial t} + \mathbf{u} \cdot \nabla \mathbf{u} \right) = -\nabla p + \mu \nabla^2 \mathbf{u}$, where μ is the dynamic viscosity.

- (c) What are the correct boundary conditions to solve the ODE equation (Do NOT solve the equation)?

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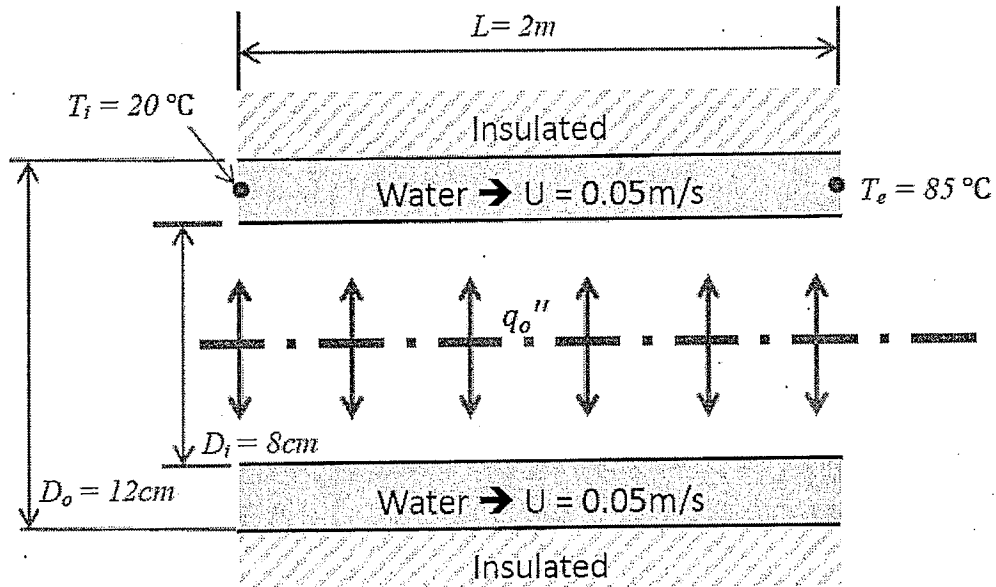
科目名稱：流體力學及熱對流【機電系碩士班甲組】

題號：438006

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9. (15 分) In an experiment designed to measure the power output from a combustion process, two cylindrical shells of diameters of 8 cm and 12 cm and length of 2 m have been placed concentrically around a flame. This process yields a uniform heat flux on the walls of the inside W/m^2 . Saturated water flows between the cylinders with an inlet temperature of $25^\circ C$ and a velocity of 0.05 m/s . The water temperature at the exit is measured to be $85^\circ C$. The outer cylinder is insulated externally. Find the value of q_0'' . 參考圖五



(圖五)

10. (20 分) A current carrying (current I and voltage V) pure copper cable of diameter D and length L is initially at T_i and suddenly placed in a water stream with h and T_∞ . Determine the time at which its temperature becomes 5°C from its final temperature.

$$T_i = 80^\circ\text{C}, h = 50\text{ W/m}^2\text{-K}, T_\infty = 20^\circ\text{C}, D = 2\text{ cm}, L = 1\text{ m}, I = 5\text{ A}, V = 20\text{ V}$$

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科目名稱：應用力學【機電系碩士班丙組】

題號：438007

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）

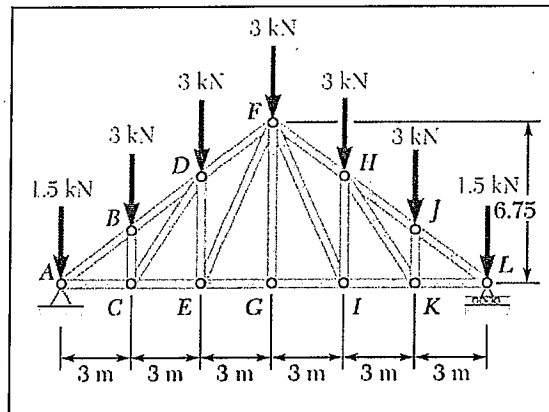
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Please choose the correct answers for problems 1 and 2.

Please be noted that the correct answers for each problem may be more than one (複選題)

1. Consider a truss is loaded as shown, then which of the following statements are correct? (25 %)

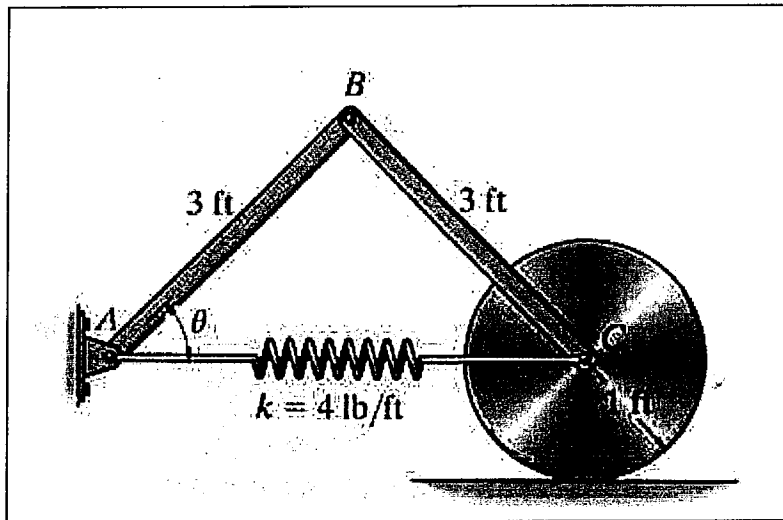
- (A) The magnitude of member CE is between 7.5 kN and 8.5 kN and is subjected to a tensile force.
- (B) The magnitude of member FI is between 3.5 kN and 4.5 kN and is subjected to a compressive force.
- (C) There is only one zero-force member in the loaded truss as shown.
- (D) If the external loadings acting on the joints A, B, D, H, J, L were removed, then there are nine zero-force members in the truss.
- (E) If the external loadings acting on the joints A & B were removed, then member AB is a zero-force member.
- (F) None of the previous statements is correct.



2. A 200-kg space vehicle is observed at $t = 0$ to pass through the origin of a Newtonian reference frame $Oxyz$ with velocity $\mathbf{v}_0 = (150 \text{ m/s}) \mathbf{i}$ relative to the frame, where $[\mathbf{i}, \mathbf{j}, \mathbf{k}]$ are the base unit vectors of the Newtonian reference frame $Oxyz$. Following the detonation of explosive charges, the vehicle separates into three parts A, B, and C, of mass 100 kg, 60 kg and 40 kg, respectively. Knowing that 'at $t = 2.5$ s the positions of parts A and B are observed to be A (555, -180, 240), and B (255, 0, -120) where the coordinates are expressed in meters. It is also known that at $t = 2.5$ s, the velocity of part A is $\mathbf{v}_A = (270 \text{ m/s}) \mathbf{i} - (120 \text{ m/s}) \mathbf{j} + (160 \text{ m/s}) \mathbf{k}$ and the velocity of part B is parallel to the xz plane. Then, which of the following statements are correct? (25 %)

- (A) The mass center of parts A, B, and C is travelling with constant acceleration 9.81 m/s^2 .
- (B) Both of the position vector and velocity vector of the mass center of parts A, B, and C are perpendicular to the yz plane of the frame $Oxyz$.
- (C) At $t = 2.5$ s, the position of part C is (105, 450, 420) m.
- (D) At $t = 2.5$ s, the velocity of part C is $(-30 \text{ m/s}) \mathbf{i} + (300 \text{ m/s}) \mathbf{j} + (280 \text{ m/s}) \mathbf{k}$
- (E) In this problem, both of the total linear momentum and total angular momentum about origin O of the system are conservative.
- (F) None of the previous statements is correct

3. The assembly consists of two 15-lb slender rods and a 20-lb disk. If the spring is unstretched when $\theta = 45^\circ$ and the assembly is released from rest at this position, determine the angular velocity of rod AB at the instant $\theta = 0^\circ$. The disk rolls without slipping. (限用功能原理為主來計算) (25 %)



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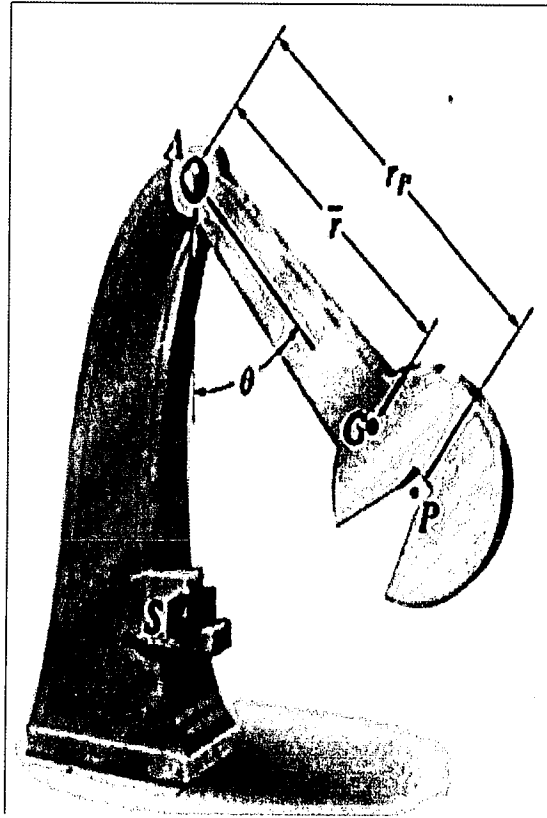
科目名稱：應用力學【機電系碩士班丙組】

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4. The Charpy impact test is used in materials testing to determine the energy absorption characteristics of a material during impact. The test is performed using the pendulum, which has a mass m , mass center at G , and a radius of gyration k_G about G . Determine the distance r_p (in terms of k_G and \bar{r}) from the pin at A to the point P where the impact with the specimen S should occur so that the horizontal force at the pin at A is essentially zero during the impact. For the computation, assume the specimen absorbs all the pendulum's kinetic energy during the time it falls and thereby stops the pendulum from swinging when $\theta = 0^\circ$. (25 %)



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科目名稱：科技英文【機電系碩士班戊組】

題號：438008

※本科目依簡章規定「不可以」使用計算機

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I. Single Choice Questions (3% for each)

1. It is said he was a man, _____ to have the vision of an eagle and courage of a lion.
(A) who appeared
(B) he appeared
(C) that appears
(D) and appears
2. After the discovery of the abandoned getaway vehicle, _____ believed to be hiding in the nearby Riverside forest region.
(A) that the bank robber is
(B) the bank robber who
(C) the bank robber is
(D) the bank robber who is
3. _____ getting the highest result in the class, John still had problems with the teacher.
(A) Despite of
(B) In spite of
(C) Even though
(D) Nonetheless
4. This new service will be available to all users _____ up for paid membership.
A. that signed
B. that signed it
C. which signed
D. sign
5. _____ explores the nature of guilt and responsibility and builds to a remarkable conclusion.
(A) The written beautifully novel
(B) The beautifully written novel
(C) The novel beautifully written
(D) The written novel beautifully
6. The beginning of the Symbolist movement in art _____ having begun in the late 1880's.
(A) is regarded as
(B) is regarded
(C) is regarding
(D) regarded as
7. _____ in history caused as much shock and grief worldwide as the 2004 tsunami disaster in Asia.
(A) None natural disaster
(B) That natural disaster
(C) No natural disaster
(D) The natural disaster
8. I think Jane deserved to be fired for her _____.
(A) totally behavior irresponsible
(B) behavior totally irresponsible
(C) irresponsible totally behavior
(D) totally irresponsible behavior

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

科目名稱：科技英文【機電系碩士班戊組】

題號：438008

※本科目依簡章規定「不可以」使用計算機

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9. _____ appeared to be coming from the science lab next door.
(A) The pungent unpleasant odor of burning plastic
(B) The unpleasant pungent odor of burning plastic
(C) The pungent unpleasant odor of plastic burning
(D) The unpleasant odor pungent of burning plastic
10. The teacher didn't know _____ .
(A) which noun clauses teach
(B) which noun clauses to teach
(C) why noun clauses to teach
(D) when noun clauses to teach
11. The English word formula is derive _____ the Latin forma, or form.
(A) to
(B) from
(C) in
(D) by
12. Most scholars accept Dr. Paul's proposal _____ principle, but they need to be cautious and take other ideas into consideration.
(A) at
(B) from
(C) in
(D) by
13. The minister stepped down in response _____ public pressure over the insider-trading scandal.
(A) to
(B) of
(C) in
(D) by
14. The columnist wrote _____ conclusion that the U.S. is entering recession after the subprime mortgage crisis.
(A) to
(B) of
(C) in
(D) by
15. Previous _____ the establishment of laws in 2007, abortion was illegal in the Mexican city.
(A) to
(B) of
(C) in
(D) by
16. Students are required to _____ critical evaluations of the methodology adopted in the journal article.
(A) choose
(B) work
(C) produce
(D) make
17. The prisoners were _____ to the cells 24 hours a day after their attempt to escape.

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

科目名稱：科技英文【機電系碩士班戊組】

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- (A) closed
- (B) restricted
- (C) approached
- (D) arrived

18. One effective strategy _____ to fight AIDS was to expand the testing and treatment programs aimed at high-risk populations.

- (A) spread
- (B) worked
- (C) obtained
- (D) adopted

19. In order to find out the cause of earthquakes, the seismologist _____ out a geological survey of the area.

- (A) made
- (B) worked
- (C) carried
- (D) derived

20. The astrophysicists try to _____ how a star behaves from an analytical model.

- (A) deduce
- (B) exclude
- (C) ensure
- (D) dominate

II. English to Chinese Translation

1. Another effort aims to study energy harvesting and actuation properties of the modified NFES (near-field electrospinning) piezoelectric nanofibers. A electrospinning technique by means of NFES was developed to produce the controllable nanofiber deposition. Compared with the conventional electrospinning process, it shows that decreasing electrical field in continuous NFES results in smaller line width fibers deposition. (20%)
2. To overcome these shortcomings, a new approach to the control of vision-guided calibration-free robots is presented in this paper. (5%)
3. Although substantial studies have been performed on the critical factors that affect the electromigration lifetime of Al alloys, those of Cu are still critically lacking. (5%)
4. In this experiment, we constructed a test bed as shown in Fig. 13 that consists of a dual arm and a real-time stereo system. (5%)
5. Clearly, the findings indicate that the amount of exposure to a foreign language has a positive effect on student performance. (5%)

