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| 考試科目 | 新媒體科技 | 所別 | 數位內容碩士學位 創意傳播組 | 考試時間 | 3月7日(日)第三節 551 |
|------|-------|----|-------------------|------|-------------------|

這份考題有 3 大題，考試目的在瞭解你對新媒體科技的理解程度；以及測試你思考推論的能力。重點在於你能否舉出事實，並加以論述。純然背誦特定的理論或數據，未必有用。現在請你看清楚題目，然後作答。

1. 某圖書館為鼓勵國小高年級學生閱讀與分享故事，公開徵求產品(服務)企劃書。條件如下：計劃期限 12 個月，經費 100 萬元，產品(服務)要能持續使用。請你提供一項數位化產品(服務)企劃，來幫助圖書館達成此目的。

- (1) 請說明產品的設計理念、產品的功能、開發流程及時程、產品的草圖。(25%)
- (2) 請輔以理論說明你的產品為何可達到激勵學生閱讀與分享故事的目的。(25%)

2. 目前台灣地區許多出版業者都熱衷於推廣電子書，希望能夠突破普及門檻 (critical mass)，當然關係電子書普及因素很多，但其中「閱讀習慣」是非常關鍵的因素。

- (1) 請從你自己過去的觀察體驗出發，說明本地閱聽大眾最重要的閱讀習性是什麼？(10%)
- (2) 請針對這些習性，構思一組電子書內容或服務的新點子。(10%)
- (3) 請提出至少兩個理由，說服公司股東為何該投資此點子。(10%)

(第 3 大題在下一頁，請繼續作答)

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|------|--------|----|------------------------|------|------------|
| 考試科目 | 新媒體的科技 | 所別 | 數位內容碩士學位 創意傳播組 5151 | 考試時間 | 3月7日(日)第三節 |
|------|--------|----|------------------------|------|------------|

3. 某公司目前正研發華語行動學習軟體，這項學習軟體主要對象為外籍華語學習者。研發團隊完成初步設計後，邀請一群使用者進行「可用性測試」(usability test)，測試團隊提供手機給 30 位受測者，之後要求受測者填寫問卷，原問卷為英文，共有十題，受測者被要求選答 1-5 選項，1 為非常不滿意，2 為不滿意，3 為普通，4 為滿意，5 為非常滿意。報告以 4 和 5 之和為滿意程度。回收資料經過整理如附錄一。

請仔細閱讀這份資料之後，回答下列兩個問題：

- (1) 這份資料反映了軟體設計的優缺點是什麼？如何改進？(10%)
- (2) 這份測試資料是否存在可改善空間？如果要重新設計測試方法，應該更改方向為何？(10%)

附錄一：測試資料分析

○○行動學習軟體滿意度調查報告

| 題項 | 問卷內容 | 滿意人數 | 百分比 |
|----|---------------------|------|-------|
| 1 | 本軟體容易安裝 | 13 | 41.9% |
| 2 | 本軟體使用說明書非常完整 | 17 | 54.8% |
| 3 | 本軟體使用時不易當機 | 24 | 77.4% |
| 4 | 和類似的軟體比較，本軟體很好用 | 2 | 50.0% |
| 5 | 使用者介面相當友善 | 17 | 54.8% |
| 6 | 本軟體語音分析功能非常有用 | 26 | 83.9% |
| 7 | 本軟體提供的語音清晰度非常令人滿意 | 12 | 36.1% |
| 8 | 本軟體提供的功能鍵非常有效 | 10 | 32.3% |
| 9 | 本軟體提供的轉接介面流暢度非常令人滿意 | 22 | 71.0% |
| 10 | 總體而言，本學習軟體令人滿意 | 28 | 90.3% |

受測人數：30 人

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| 考試科目 | 媒介敘事 | 所別 | 數位內容碩士學位學程 創意傳播組 | 考試時間 | 3 月 7 日 (A) 第四節 5151 |
|------|------|----|---------------------|------|-------------------------|

考試科目：媒介敘事

所別：數位內容碩士學位學程創意傳播組

考試時間：3 月 7 日 (星期日) 第四節

說明：以下為兩題申論題，各為 50 分。總分 100 分。

第一題：

John Hartley (2003) 定義電視具有「吟遊功能」(bardic function)，類似中古時代的吟遊詩人以說故事的方式，將他的所見所聞描述出來，好讓他的閱聽眾理解與認知這個世界發生的大小事。

數位時代帶來重大變革，影響各種新舊媒介，例如以往強調的「大眾傳播」，已逐漸轉向為注重分眾市場的「窄播」或「小眾傳播」；或者是，以往的「機械複製」，已逐漸被「數位複製」所取代。

請問：

電視原有的「吟遊功能」，到了數位時代，又產生怎樣的變化？請列舉兩種至三種傳播新媒介（不限於電視或數位電視），描繪他們說故事的形式與結構，如何有別於以往。

第二題：

YouTube 自 2005 年創立至今，不到五年的時間，單日流量已經超過 10 億，是目前影片分享網站的第一品牌。YouTube（以及其他類似的影片分享網站）的主要價值在於：(1) 簡化網路影片上傳的程序，並且讓影片廣為周知；(2) 提供免費的影片儲存空間；(3) 方便影片置入其他網站或部落格。這對於「影片」在廣告活動 (advertising campaign) 中扮演的角色有很大的影響。早期的作法是直接將電視廣告上傳到 YouTube 與人分享，晚近則是為網路世界量身打造廣告影片。

請你：

1. 例舉一個國內或國外的優秀案例，說明廣告主如何（有創意的）將 YouTube 整合到廣告活動中，提昇溝通效益。(20%)
2. 如果你有 10 萬元預算為政大數位內容學程做招生推廣，你會如何整合網路影片和其他溝通媒介，以產生最大的效果？請說明你影片的創意。(30%)

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|------|-------|----|----------------------|------|------------|
| 考試科目 | 計算機概論 | 所別 | 數位內容碩士 學位學程/資訊技術組 | 考試時間 | 3月7日(日)第三節 |
|------|-------|----|----------------------|------|------------|

(10%) 1. Calculate the bandwidth \times delay product for the following links. Use one-way delay, measured from first bit sent to first bit received.

- (a) A 1.5-Mbps T1 link, with a transcontinental one-way delay of 50ms.
- (b) A 1.5-Mbps T1 link through a satellite in geosynchronous orbit, 35,900km high. The only delay is speed-of-light propagation delay.

(10%) 2. An IEEE 802.5 token ring has five stations and a total wire length of 230m. How many bits of delay must the monitor insert into the ring? Do this for both 4 and 16 Mbps; use a propagation rate of 2.3×10^8 m/s.

(10%) 3. An Ethernet switch is simply a bridge that has the ability to forward some number of packets in parallel, assuming the input and output ports are all distinct. Suppose two such N -port switches, for a large value of N , are each able to forward individually up to three packets in parallel. They are then connected to one another in series by joining a pair of ports, one from each switch; the joining link is the bottleneck as it can, of course, carry only one packet at a time.

- (a) Suppose we choose two connections through this combined switch at random. What is the probability that both connections can be forwarded in parallel? (Hint: This is the probability that at most one of the connections crosses the link.)
- (b) What if three connections are chosen at random?

(10%) 4. Suppose host A is sending to a multicast group; the recipients are leaf nodes of a tree rooted at A with depth N and with each nonleaf node having k children; there are thus k^N recipients.

- (a) How many individual link transmissions are involved if A sends a multicast message to all recipients?
- (b) Suppose A sends to all recipients, but some messages are lost and retransmission is necessary. Unicast retransmissions to what fraction of the recipients is equivalent, in terms of individual link transmissions, to a multicast retransmission to all recipients?

(10%) 5. Suppose TCP operates over a 1-Gbps link.

- (a) Assuming TCP could utilize the full bandwidth continuously, how long would it take the sequence numbers to wrap around completely?
- (b) Suppose an added 32-bit timestamp field increments 1,000 times during the wraparound time you found above. How long would it take for the timestamp to wrap around?

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| 考試科目 | 計算機概論 | 所別 | 數位內容碩士 學位名額/資訊技術 | 考試時間 | 5152 | 3月7日(日)第三節 |
|------|-------|----|---------------------|------|------|------------|

6. [Logic Gates] (1) Write down the truth table for XOR gate (A,B: input, C:output). (3%) (2) Implement XOR using basic logic gates (AND, OR, NOT). (3%) (3) Show how an XOR gate can be used as an INVERTER. (4%) (4) Use only XOR gates to generate the parity bit for a 4-bit (not including the parity bit) even-parity system. (5%)
7. [Run-length Encoding] (1) Encode the string DDDDDCCCTTTTTTTT using run-length encoding and compute the compression ratio. (6%) (2) Does RLE always save space? If so, prove it. If not, give a counterexample. (4%)
8. [Boolean Algebra] (1) Prove DeMorgan's theorem in N-variables. (4%) (2) Show the universality of NAND gate by implementing AND, OR, NOT using only NAND gates. (6%)
9. [Entropy, Huffman coding] Huffman coding is an entropy coding algorithm used for lossless data compression. The definition calls for the computation of the entropy: $H = \sum_i p_i \log_2 \frac{1}{p_i}$ where p_i is the probability of the i -th symbol.
- (1) Show that a symbol with zero probability will have zero contribution to the entropy. (6%)
- (2) When will H be maximized and minimized? (4%)
10. [Touch Screen] Touch screens have gained a lot of popularities recently. There are several technologies used to implement touch screens, including resistive, capacitive, infrared and surface acoustic wave (SAW) touch screens. Pick one that you are familiar with and explain how it works. (5%)

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| 考試科目 | 程式設計與資料結構 | 所別 | 數位內容碩士學位學程/ 資訊技術組 5152 | 考試時間 | 3 月 7 日(日) 第 4 節 |
|------|-----------|----|------------------------------|------|------------------|

可用中文或英文回答

1. (20%) True or False (Use **O** for true or **X** for false as the answer to each of the following statements.)

- (1) $O(n^d)$ is of exponential order, where d is a constant.
- (2) All recursive procedures can be implemented as iterative procedures.
- (3) Some sorting algorithms can perform in linear time.
- (4) A binary search in a linear sorted array needs $O(\log n)$ time.
- (5) With the preorder traversal in a binary search tree, we can get a sorted sequence.
- (6) When some rotations are done on an AVL tree due to an unbalanced node after insertion, the height of the tree may be changed.
- (7) The number of elements stored in the root node of a B-tree of order n is between $\left\lfloor \frac{n-1}{2} \right\rfloor$ and $n-1$.
- (8) All leaves in a B-tree are on the same level.
- (9) The load factor for a hash table is defined as the ratio of the number of elements in the hash table to the table size.
- (10) For all possible inputs, a linear algorithm to solve a problem always perform faster than a quadratic algorithm to solve the same problem.

2. (20%) Single Selection

- (1) Suppose that n is the number of input data. Which statement is correct?
 - (A) A binary search in a linear sorted array needs $O(\log n)$ time.
 - (B) An insertion in a linear sorted array needs $O(\log n)$ time.
 - (C) The binary search can be performed in a linearly linked list if the list is sorted.
 - (D) A deletion in a linearly (singly) linked list can be done in $O(1)$ time if the node to be deleted is known.
- (2) Which sorting algorithm(s) has time complexity $O(n \log n)$ in the worst case?
 - (A) Bubble sort
 - (B) Shell sort
 - (C) Heapsort
 - (D) Quicksort.
- (3) Which statement is *correct* for an AVL tree?
 - (A) An insertion requires at most three rotations.
 - (B) A deletion requires at most two rotations.
 - (C) The level difference of any pair of leaves is at most one.
 - (D) The height difference of the two subtrees of any node is at most one.

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| 考 試 科 目 | 程式設計與資料結構 | 所 別 | 數位內容碩士學位學程/ 資訊技術組 5152 | 考 試 時 間 | 3 月 7 日(日) 第 4 節 |
|---------|-----------|-----|---------------------------|---------|------------------|

- (4) Which statement is *correct* for an almost complete binary tree?
- (A) It is a strictly binary tree.
 (B) Each node, except for the root, has its sibling node.
 (C) At each node, the height of the left subtree is always greater than or equal to that of the right subtree.
 (D) All leaf nodes can appear only on the lowest level.
- (5) If G is a directed graph with 20 vertices, how many boolean values will be needed to represent G using an adjacency matrix?
- (A) 40
 (B) 200
 (C) 210
 (D) 400
- (6) How many linked lists are needed to represent a graph with n nodes and m edges, when using an edge list representation?
- (A) m
 (B) n
 (C) $m + n$
 (D) $m * n$
- (7) An array of queues can be used to implement a priority queue, with each possible priority corresponding to its own element in the array. When is this implementation NOT feasible?
- (A) When the number of possible priorities is huge.
 (B) When the number of possible priorities is small.
 (C) When the queues are implemented using a linked list.
 (D) When the queues are implemented with circular arrays.
- (8) Suppose we are sorting an array of eight integers using quicksort, and we have just finished the first partitioning with the array looking like this:
- 2 5 1 7 9 12 11 10
- Which statement is correct?
- (A) The pivot could be either the 7 or the 9.
 (B) The pivot could be the 7, but it is not the 9.
 (C) The pivot is not the 7, but it could be the 9.
 (D) Neither the 7 nor the 9 is the pivot.
- (9) Which of these is the correct big-O expression for $1+2+3+\dots+n$?
- (A) $O(\log n)$
 (B) $O(n)$
 (C) $O(n \log n)$

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|---------|-----------|-----|---------------------------|---------|------------------|
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|---------|-----------|-----|---------------------------|---------|------------------|

(D) $O(n^2)$

(10) Consider a complete binary tree with 1000 nodes, with the data stored in the elements $a[0]..a[999]$ of an array. Where are the parent and the right child of the node stored at $a[100]$? (Assume that the left child is stored before the right child.)

(A) Parent at 49, right child at 200

(B) Parent at 49, right child at 201

(C) Parent at 50, right child at 200

(D) Parent at 50, right child at 201

3. (10 %) A function f in the C language is defined as follows.

```
int f(int a, int m) {
    int t, ans;
    ans=1;
    t=a;
    while(m>0) {
        if (m % 2 ==1) /* e.g. 7%2=1, 6%2=0 */
            ans = ans * t;
        t = t * t;
        m = (int) (m / 2); /* e.g. 7/2=3, 6/2=3 */
    } /* end of while() */
    return(ans);
}
```

(a) What is the answer of $f(3, 5)$?

(b) Use arithmetic expressions or simple sentences to describe what f is.

4. (8 %) An array $int A[m][n]$ is given. Assume that each element of array A occupies 4 units of storage. Suppose the addresses of $A[3][4]$ and $A[2][7]$ are 404 and 544, respectively. The first element of A is $A[0][0]$.

(a) Is array A in *row-major* or *column-major*? Why?

(b) What is the address of $A[0][0]$?

(c) What is the address of $A[5][6]$?

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| 考 試 科 目 | 程式設計與資料結構 | 所 別 | 數位內容碩士學位學程/ 資訊技術組 5152 | 考 試 時 間 | 3 月 7 日(日) 第 4 節 |
|---------|-----------|-----|------------------------------|---------|------------------|

5. (10 %) Assume that we are given an infix expression: $3+4*(5*6-7)$.
- Draw its expression tree.
 - Suppose that we are using a stack to convert the expression from the infix to the postfix notation. What is the maximum number of symbols that will appear on the stack at one time during the conversion of this expression?
 - What is the resulting postfix expression?
6. (10 %) Consider inserting the following keys into a hash table of length $m=13$:
- 152 44 39 22 134 53 144 131 0 135
- The hash function is $(k \bmod m)$. Please draw the resulting hash table if we use
- linear probing; and
 - quadratic probing function of $F(i)=i^2$, respectively.
7. (8 %) The largest element in a heap always appears in position 1, and the next largest element could be in position 2 or position 3. Please give the lists of the smallest (earliest) and the largest (latest) possible positions in a heap of size 15 for the k th largest element, for $k=3, 4, 5$, respectively. Assume that the values of all elements are distinct.
8. (14 %) Consider a set of unsorted numbers in a binary tree. For a given input element x , we will try to find the number that is the closest to x in the tree. That is, y is the answer if $|x-y|$ is the minimum. Write a *recursive* procedure in a language of your choice (please specify) to return the closest number. If the language is in C, the data structure and function prototype are as follows.
- ```
struct treenode {
 int data;
 struct treenode *left;
 struct treenode *right;
}
int near(int x, struct treenode *tree)
```

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| 備<br>註 | 試 題 隨 卷 繳 交 |
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