

國立嘉義大學 104 學年度

資訊工程學系碩士班招生考試試題

科目：離散數學

一、選擇題：單選 (30%)

- The postfix expression: $a b d e * + a d * f - / - b -$. Then the infix expression is
(1) $b - (d + b * e) / (a * d - f) - a$
(2) $a - (b + d * e) / (a * d - f) - b$
(3) $b - (a + d * f) / (b * d - e) - a$
(4) $a - (f + d * a) / (e * d - b) - b$
- How many positive integers less than 30 that are relatively prime to 20?
(1) 9 (2) 10 (3) 11 (4) 12.
- What is the maximum number of edges in the tree with n vertices?
(1) n (2) n^2 (3) $n - 1$ (4) $(n - 1)^2$.
- How many subsets are there of a set consisting of n elements?
(1) n (2) $n - 1$ (3) n^2 (4) 2^n .
- 嘉義大學規定研究所的課程至少要有兩位研究生選修才能開課，資工系本學期開了 15 門課供研究生選修，請問至少要有多少位研究生才能保證至少有一門課能開成？
(1) 3 (2) 16 (3) 31 (4) 30
- 某同學本學期選修離散數學、機率論、以及線性代數三門課。他決定發憤圖強，每周一到週五這五天放學後，一定要花兩小時來研讀這三門課的其中一門。若每門課至少分到一天，請問有多少種安排的方法？
(1) 15 (2) 243 (3) 150 (4) 125

二、是非題：請回答 真 (True) 或 假 (False) (20%)

- A relation R on a set A is called an equivalence relation iff it is reflexive, symmetric and transitive.
- $[(1,5)] \cap [(1,-2)] = \emptyset$.
- A relation R on a set A is called a partial order iff it is reflexive, antisymmetric and transitive.
- The real numbers in the interval $(0,1) \subseteq \mathbb{R}$ are countable.
- The Boolean values in the interval $(0,1)$ are countable.
- A simple graph G is bipartite if V can be partitioned into two disjoint subsets V_1 and V_2 such that every edge connects a vertex in V_1 and a vertex in V_2 .
- If $G = (V, E)$ is an undirected graph with m edges, then $2m = \sum_{v \in V} \deg(v)$.
- In social network, edges represent individuals or organizations and vertices represent relationships between them.
- A Hamiltonian cycle in a graph is a cycle that starts at some vertex v , visits every other vertex exactly once, and ends at v . True or false: every graph contains a Hamiltonian cycle.
- Suppose every edge in an undirected graph has a unique weight. Then there must be a minimum-cost spanning tree that does not include the edge with maximum weight.

三、簡答題

17. 設集合 $A = \{1,2\}$ 、 $B = \{3,4,5\}$ ，以表列法明確寫出積集合 (product set) $A \times B$ 。(10%)

18. 使用矛盾證法證明 $\sqrt{3}$ 是無理數。(10%)

19. Let $a_n = 2^n + 5 \cdot 3^n$ for $n=0, 1, 2, \dots$

(a) Find a_0, a_1, a_2, a_3 and a_4 . (5%)

(b) Show that $a_2 = 5a_1 - 6a_0$, $a_3 = 5a_2 - 6a_1$, and $a_4 = 5a_3 - 6a_2$. (5%)

20. How many solutions are there for the map-coloring problem for the following figure?

(a) The constraint is that adjacent regions must have different colors using three colors. (10%)

(b) The constraint is that all regions must have different colors using three colors. (10%)

