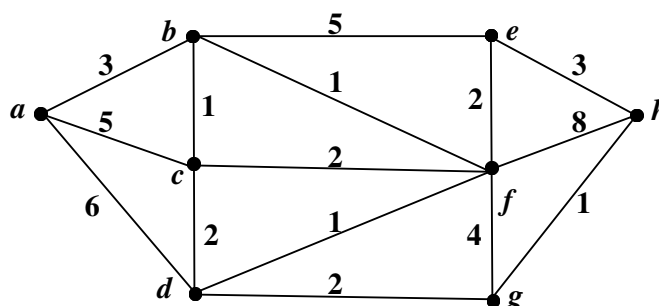


國立嘉義大學 114 學年度
資訊工程學系碩士班招生考試試題

科目：離散數學（共 100 分）

- 一、 Given the value of $p \rightarrow q$, please answer the following question related to propositions:
- (a) If the value of $p \rightarrow q$ is false, determine the value of $(\bar{p} \vee \bar{q}) \rightarrow q$. (10%)
 - (b) If the value of $p \rightarrow q$ is true, can you determine the value of $\bar{p} \vee (p \leftrightarrow q)$? (10%)
- 二、 The following graph represents the communication channels and their respective time delays (in minutes) between eight communication centers. The centers are depicted as vertices, the channels as edges, and the communication time delay for each channel is indicated by the weight of the edge. Suppose communication center a broadcasts news through all its channels at 8:00 a.m. Other centers will rebroadcast the news through their channels immediately upon receiving it. For communication centers b, c, d, e, f, g , and h , determine the earliest time each receives the news. (20%)

Communication Channel



- 三、 There are 36 distinct time slots available for scheduling classes at a university. Given that there are 698 classes, determine the minimum number of classrooms required. (10%)

- 四、A deck of cards has 52 cards in total. Half of the deck is red and half is black. A quarter of the deck has the symbol hearts, a quarter has the symbol diamonds, a quarter has the symbol spades, and a quarter has the symbol clubs. How many ways are there to pick 15 cards if:
- (a) You wish to pick an even number of black cards and an odd number of red cards? (10%)
 - (b) You wish to pick at least two of each symbol, but no more than 5 hearts and 6 spades? (10%)

- 五、Most medical tests occasionally produce incorrect results, called false positives and false negatives. When a test is designed to determine whether a patient has a certain disease, a **false positive** result indicates that a patient has the disease when the patient does not have it. A **false negative** result indicates that a patient does not have the disease when the patient does have it.

When large-scale health screenings are performed for diseases with relatively low incidence, those who develop the screening procedures have to balance several considerations: the per-person cost of the screening, follow-up costs for further testing of false positives, and the possibility that people who have the disease will develop unwarranted confidence in the state of their health. Consider a medical test that screens for a disease found in 5 people in 1,000. Suppose that the false positive rate is 3% and the false negative rate is 1%. Then 99% of the time a person who has the condition tests positive for it, and 97% of the time a person who does not have the condition tests negative for it.

- (a) What is the probability that a randomly chosen person who tests positive for the disease actually has the disease? (10%)
- (b) What is the probability that a randomly chosen person who tests negative for the disease does not indeed have the disease? (10%)

- 六、Solve the recurrence relation $a_n - 6a_{n-1} - 7a_{n-2} = 0$ for $n \geq 5$ where $a_3 = 344$ and $a_4 = 2400$. (10%)