※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Discuss the roles of dislocations in the strength and ductility of steel. (10%)

2. What is the Paris law, and how to use it to estimate the fatigue life of material? (10%)

3. Discuss the chemical reactions involved C_2S and C_3S during cement hydration. (10%)

4. Discuss the five types of Portland cement defined by ASTM and their applications in practice. (10%)

5. Discuss how porosity affects the mechanical properties of cement. (10%)

6. Discuss the microstructures of C-S-H and its formation mechanisms. (10%)

7. Define the following terms: (a) plastic strain, (b) complex modulus, (c) fracture toughness, (d) stress intensity factor, (e) Poisson's ratio. (20%)

8. Discuss the roles of aggregates in concrete. What is the alkali-silica reaction. (10%)

9. Discuss the fatigue striation and its formation mechanisms. (10%)