

系所組別： 生物醫學工程學系丙組

考試科目： 生物力學

考試日期： 0219，節次： 2

※ 考生請注意：本試題 可 不可 使用計算機**2011 Biomedical Engineering Master Entrance Exam — Biomechanics (可用計算機)****I. Define the following terms with description or graph.**

1. Free-body diagrams (5%)
2. Creep (5%)
3. Stress, yield stress, and principal stress (6%)
4. Bone remodeling (5%)
5. Dynamics, Kinetics and kinematics (6%)
6. Temporal sequence of "Gait cycle" of bipedal locomotion (8%)

**II. Calculations and essay questions**

1. The biomechanics of pitching of a baseball pitcher. Please list the 5 stages of pitching sequence and the function of soft tissues around shoulder in these stages. (10%)
2. In articular cartilage, lubrication is an important characteristic for function of joint. From engineering point of view, there are two fundamental types of lubrication. Please describe them. (10%)
3. A long jumper leaves the ground at an angle of 25 degrees with respect to the horizontal with a resultant velocity of 9 m/s. What was the horizontal velocity of the jumper at takeoff in m/s? What was the vertical velocity at takeoff in m/s? How high did the center of mass (CM) rise above the point of takeoff? How far did the CM of the jumper land? Is 25 degrees the longest the jumper can reach with the same initial resultant velocity 9 m/s? (15%)
4. A 1.2 m golf club is swung in a planar motion by a right-handed golfer with an arm length of 0.76 m. If the initial velocity of the golf ball is 35 m/s, what was the angular velocity (rad/s) of the left shoulder at ball contact? Assume that the left arm and golf club form a straight line and that the initial ball velocity is the same as the linear velocity of the club head at impact. (5%)
5. Please list possible factors that affect the biomechanical properties of tendons and ligaments. (10%)
6. Mechanical work is performed and joint motion is produced through the following forms of muscle contraction: Please explain them: (15%)
  - A. Concentric contraction
  - B. Eccentric contraction
  - C. Isokinetic contraction
  - D. Isoinertial contraction
  - E. Isotonic contraction