

國立虎尾科技大學 106 學年度第一學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

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科目：工程材料

注意事項：

(1) 本試題共有四題，每題二十五分，合計一百分。

(2) 可使用計算機 close book

(1) Please define the meaning of the following items :

(a) Endurance Limit. (5%)

(b) Residual Stress. (5%)

(c) Brittle Fracture. (5%)

(d) Toughness.(5%)

(e) Work Hardening.(5%)

(2) (a) Explain the theory and design of C-60 Buckyball field-effect transistors (FETs). (15%)

(b) Describe the main structure of a single wall carbon nanotube (SWCNT). (10%)

(3) A continuous and aligned glass fiber-reinforced composite consists of 40 vol% of glass fibers having a modulus of elasticity of 69 GPa and 60 vol% of a polyester resin that displays a modulus of 3.4 GPa .

(a) Compute the modulus of elasticity of this composite in the longitudinal direction. (5%)

(b) If the cross-sectional area is 250 mm² and a stress of 50 MPa is applied in this longitudinal direction, compute the magnitude of the load carried by each of the fiber and matrix phases. (10%)

(c) Determine the strain that is sustained by each phase when the stress in part (b) is applied. (10%)

(4) The stress-strain diagram for a steel alloy having an original diameter of 0.5 in. and a gauge length of 2 in. is given in the figure as shown.

(a) Determine the modulus of elasticity E . (5%)

(b) Determine the load P_y applying on the specimen that causes yielding. (5%)

(c) If the specimen is loaded until it is stressed to 70 ksi, determine the recovered elastic strain ϵ_{rec} after it is unloaded. (5%)

(d) If the specimen is loaded until it is stressed to 70 ksi, determine the amount of permanent increase in gauge length δ after it is unloaded. (10%)

