＊本測驗不得參考任何資料！

1. 解釋名詞

(20%)(a) Allowance (b) Fatigue (c) Reliability (d) Fundamental law of gearing

2. What are the most important factors that modify the endurance limit of
(15%) mechanical element.

3. A 1010 steel machine component is subject to the following state of stresses :

(20%)
$$\begin{bmatrix} \delta_{xx} & \delta_{xy} & \delta_{xz} \\ \delta_{yx} & \delta_{yy} & \delta_{yz} \\ \delta_{zx} & \delta_{zy} & \delta_{zz} \end{bmatrix} = \begin{bmatrix} 0 & 3 & 0 \\ 3 & 0 & 4 \\ 0 & 4 & 0 \end{bmatrix} \times 10^7 \, Pa.$$

The yield strength for this material is $S_{yp} = 200$ MPa. Find the safty factor by
the maximum - shear - stress theory.

4. What change in the loading of a ball bearing will double the expected life ?
(15%) What change in the loading of a roller bearing will double the expected life ?

5. A flywheel , with a mass of 4,000 Kg and radius of gyration 500 mm, has a
(30%) nominal speed of 1800 rpm but slows down to 1500 rpm, by a disk (or plate)
brake , in 1 minute during energy takeoff. The brake with a single
friction surface is 250 mm in outside diameter and 100 mm in inside diameter.
The coefficient of friction μ is 0.2. Based on uniform pressure theory,
(a) determine the torque for the brake , and
(b) calculate the required axial force.

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