1042 機械系博士班資格考試題目

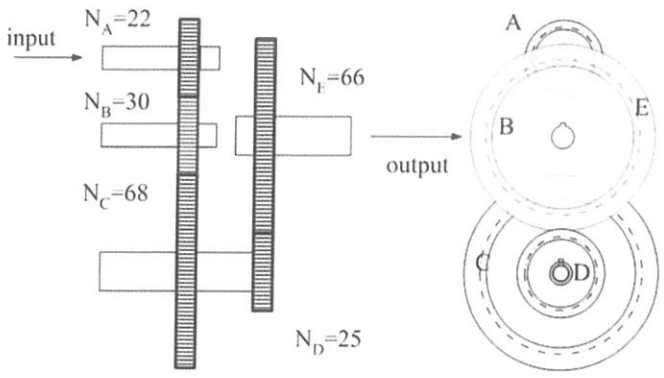
考試科目	方式	
設計製造	**Closed Book, 不可使用計算機**	**Part I**

(1) Why do we use an "involute" as the tooth profile of a spur gear? (2%) Draw a sketch to show a pair of spur gears meshing with each other. Specify the base circles, pitch circles, pressure line, and pressure angle (4%). What are the advantages of using a helical gear over a spur gear? (2%) What is the major drawback of the helical gear? (2%)

(2) Point out what is wrong with the following statements about transmission and give the correct statements (2% each)

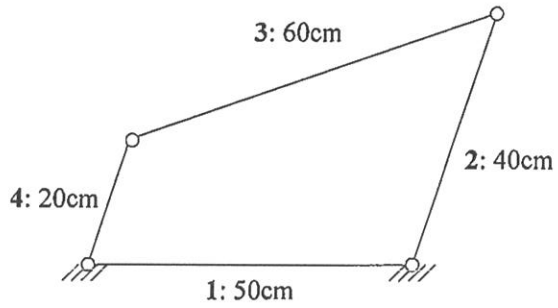
a. In a transmission, usually we use a large gear to drive a small gear (pinion) in order to reduce rotational speed.
b. On a bicycle, the chain transmission is used to reduce rotational speed from the pedal.
c. To select proper gears for transmission, the first step is to select "module" m. For high torque transmission, we should select small m in order to save space.
d. The second step of selecting gears is to determine the number of teeth of the small gear (pinion). In order to avoid interference, the minimum number of teeth in a gear is 8.
e. "Rack and pinion" is often used in the suspension system of an automobile.

(3) In the simple spur gear transmission shown below, the input gear is A, and the output gear is E. The input power is 10kW@1750 rpm. Calculate the velocity ratio of the gear train (2%).Which gear is the idle gear, and what does it do? (2%) Neglecting the effect of friction, calculate the torque output and rotation speed at the gear E (6%).

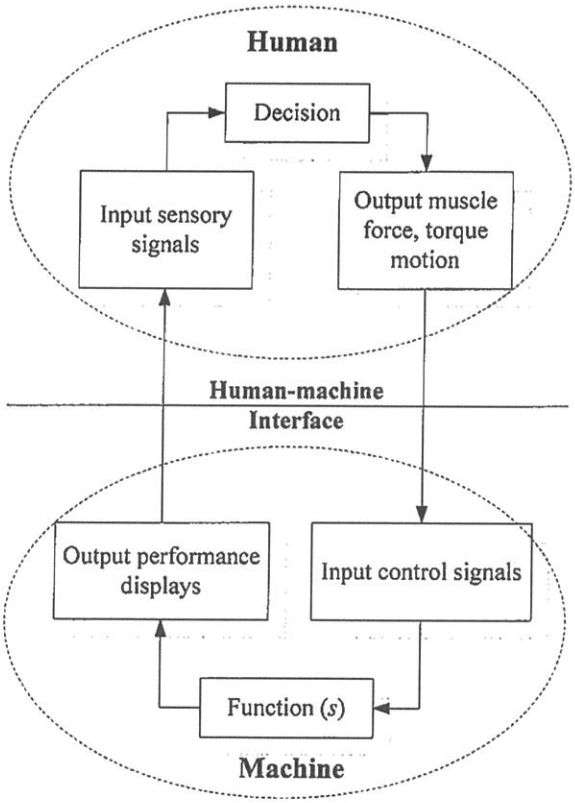


(4) The figure below is a simple four-bar linkage mechanism.

a. Why is the four-bar linkage mechanism so important? (4%)
b. Determine which link can rotate 360° by *Grashof's rule* (3%)
c. What is the name (type) of this mechanism? (3%)



(5) Using the elevator in Building 3 as an example describes the following figure of a human-machine system (10%).



1042 機械系博士班資格考試題目

考試科目	方式	
設計製造	**Closed Book,** 不可使用計算機	**Part II**

1. Name four non-traditional manufacturing processes and provide short description. 20%

2. (i) describe bulk deformation process. 5%
   (ii) describe sheet metal forming process. 5%
   (iii) describe progressive die process. 5%

3. (i) describe casting process. 5%
   (ii) what are the important parameters affecting the processes? 5%
   (iii) describe investment casting process. 5%