

Test Paper of Wuhan University of Technology (A)

2018 ~2019 academic year, 1st semester

Course: Interchangeability and Measurement Techniques **120 minutes**

32 class hours, 2 credits, Closed-book Exam, Total Points: 100

Percent in final evaluation result: 70%

No.	I	II	III	IV	V	VI	VII	Total
Full score	10	10	15	65				100
Score								

Score	
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School
Class
Student ID
Name
Serial No.

I. Multiple-choice questions (single answer) (1 point *10 = 10 points)

1. The limit deviation of the size of part is ____.

- A. obtained from measurement B. given by design
C. formed after processing

2. The largest gap for hole and shaft fitting is $+54\mu\text{m}$, and the maximum interference is $-20\mu\text{m}$, then the fit tolerance is ____.

- A、 $41\mu\text{m}$ B、 $34\mu\text{m}$ C、 $32\mu\text{m}$ D、 $74\mu\text{m}$

3. ____ is formed between the tolerance bands of shaft (basic deviation is t) and reference hole H.

- A. Clearance fit B. Interference fit
C. Transition fit D. Interference or transition fit

4. When evaluating form error with approximate method, if the error value is greater than the tolerance value, then the error ____.

- A. is unqualified B. is qualified
C. may be qualified or unqualified

5. If the physical profile of a shaft's cross section is contained by two concentric circles ($\Phi 20.05\text{mm}$ and $\Phi 20.03\text{mm}$) to form a minimum containment zone, then the roundness error of the profile is ____.

- A、 0.01mm B、 0.02mm C、 0.015mm D、 0.005mm

6. The direction tolerance comprehensively controls measured elements' _____.
 A. form error B. form error, direction error and position error
 C. direction error and position error C. form error and direction error
7. Surface roughness is a kind of _____.
 A. macrogeometric form error B. surface waviness
 C. microgeometric form error D. position error
8. The main requirement for the gear of mining machinery and hoisting machinery is _____.
 A. uniformity of load distribution B. smoothness of transmission
 C. accuracy of transfer movement D. backlash
9. During the processing of measurement data, _____ should be removed in normal cases.
 A. systemic error B. random error C. gross error D. all of these errors
10. The hole with the basic deviation between $a \sim h$ and the shaft (basic deviation is H) can form _____.
 A. transition fit of the hole-basis system B. clearance fit of the shaft-basis system
 C. transition fit of the shaft-basis system D. clearance fit of the hole-basis system

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II. True or false questions

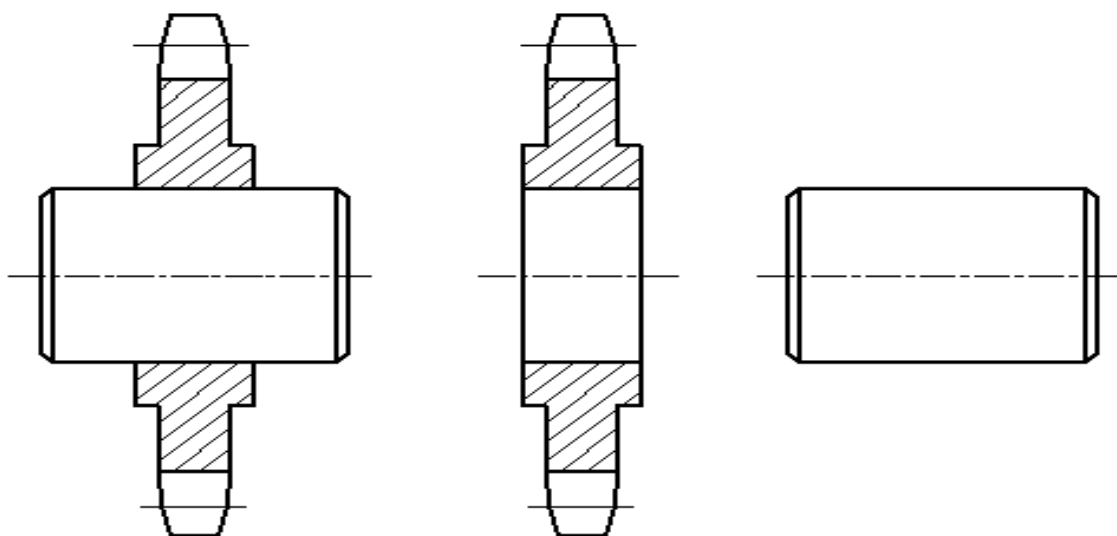
(mark $\checkmark$ for right sentences and mark X for wrong ones, 1 point *10 = 10 points)

- () 1. Choose clearance fit for the fit with relative motion, and select interference fit for the fit without relative motion.
- () 2. The relative position of the tolerance zone for holes and shafts reflects the level of difficulty in machining.
- () 3. For rolling bearing fit, only the symbols of the tolerance zone symbols for journals and housing holes are required to be marked on the drawings.
- () 4. The smaller the value of fit tolerance is, the higher the tolerance grade of a hole and shaft set will be.
- () 5. If the roundness error of a cylindrical surface is 0.01mm, its cylindricity error must be no less than 0.01mm.
- () 6. In general, the higher the tolerance grade of the size of a part is, the smaller the absolute value of the basic deviation will be.
- () 7. When marking the requirements of a form tolerance, if the tolerance value marked in tolerance box is 0.04, then the form error value of the measured elements is required to be 0.04.
- () 8. If the maximum interferences of $\Phi 50H7/s6$ and $\Phi 50S7/h6$ are the same, then they have the same minimum interference.
- () 9. If a shaft is designed to be $\Phi 20 \pm 0.05\text{mm}$, then its tolerance is $\pm 0.05\text{mm}$.
- () 10. If the dimensional tolerance zone of a part is below the zero line, then its dimensional tolerance may be less than zero.

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III. Design questions(15 points)

The nominal size of a hole—shaft fit is $\Phi 65\text{mm}$ According to relevant functional requirements, the minimum interference is $-20\text{ }\mu\text{m}$ and the maximum interference is $-75\text{ }\mu\text{m}$. Determine the fit symbol, and mark the requirements of fit and dimensional tolerance on assembly drawings and detail drawings.



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IV. Comprehensive problem solving questions (65 points)

- The power of the reducer is 4.5 kW, the rotating speed of output shaft is 70r/min, and the bearings on both ends are 30209 ($\phi 45$, $\phi 100$) conical roller bearings with light load. Properly select the fit symbol with fit requirements in the diagram below, briefly explain the reasons and mark them on the drawing. (20 points)

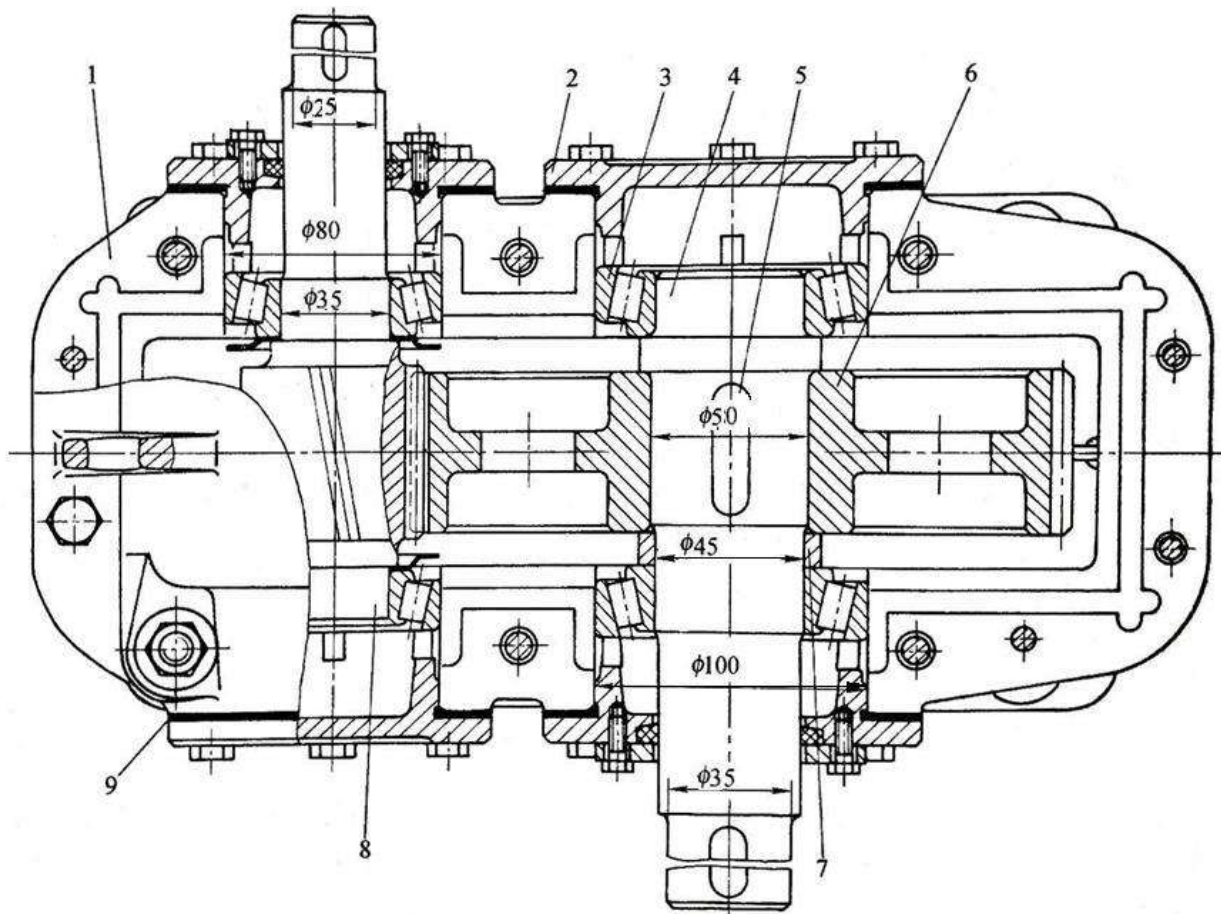


Figure 1

2. Based on the parameters of a helical gear given in the figure, provide the relevant keyway sizes beside dimension lines; mark the dimensional tolerance, geometric tolerance and surface roughness of the helical gear; improve the precision of all gear teeth of the parts shown in the figure; and briefly explain the reasons. (20 points)

法向模数	m_n	3
齿数	z_2	79
标准压力角	α_n	20°
变位系数	x_2	0
螺旋角	β	$8^\circ 6' 34''$
精度等级	8-8-7 GB/T 10095.1-2008	
齿距累积总偏差允许值	F_p	
单个齿距偏差允许值	$\pm f_{pt}$	
齿廓总偏差允许值	F_α	
螺旋线总偏差允许值	F_β	
公法线长度	跨齿数	10
	公称值及 极限偏差	$W + \frac{F_w}{2}$ 87.552 $^{+0.009}_{-0.148}$

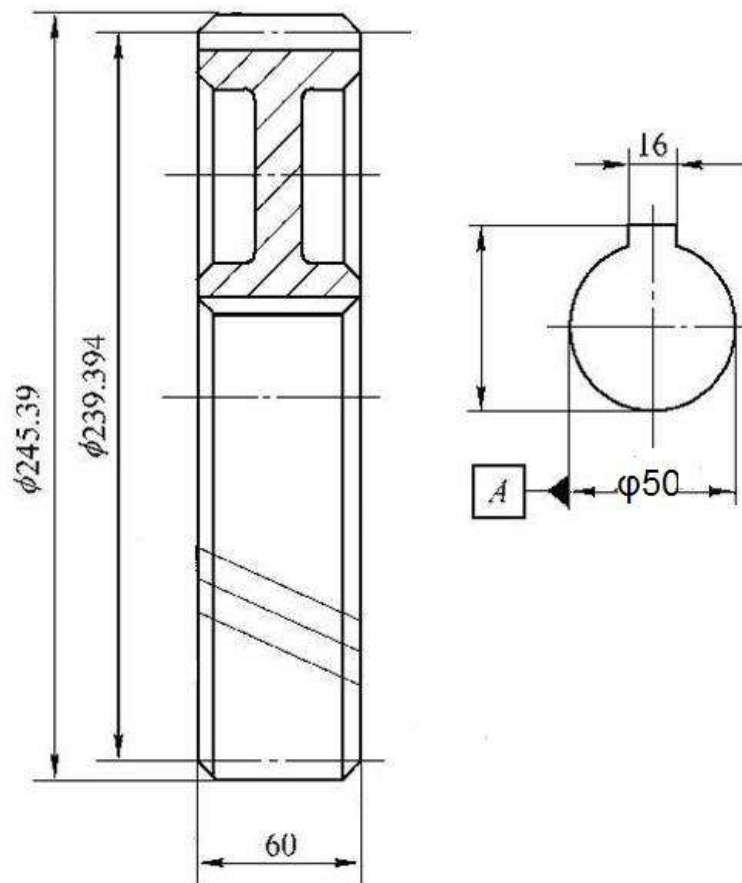


Figure 2

3. Mark appropriate size tolerance, shape and location tolerance, surface roughness tolerance principle and gear precision of gear shaft for the following figure, and briefly explain your reasons. (25points)

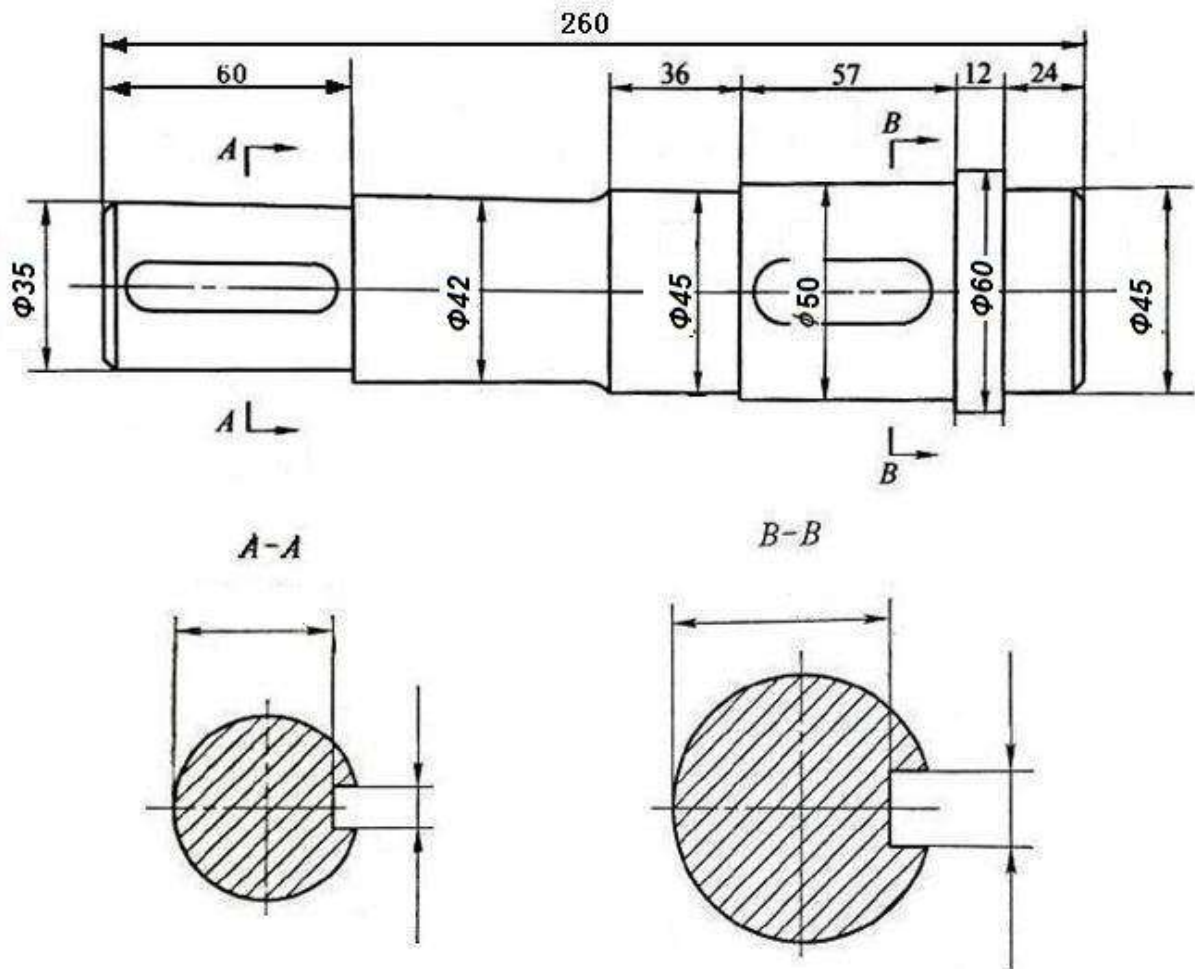


Figure 3