

Test Paper of Wuhan University of Technology (B)

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	20	15	65					100
Score								

Score	
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School
Class
Student ID
Name
Serial No.

I. Multiple-choice questions (single answer) (2 point *10 = 20 points)

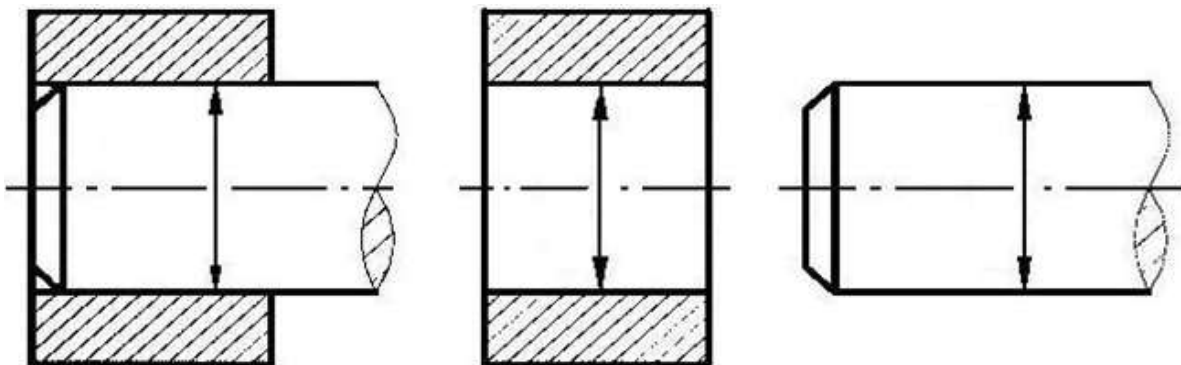
- For axial total run-out tolerance, which of the following statement is the correct ()
A. Belongs to shape tolerance B. same with control effect of parallelism
C. Belongs to position tolerance D. same with shape of tolerance zone of end face to axis perpendicularity
- Of the following statements about tolerance grade, which one is true ()
A. Higher tolerance grade means larger tolerance bandwidth.
B. As long as the operating requirement is met, lower tolerance grade shall be chosen as far as possible.
C. The fitting of hole and shaft all belongs to the same-grade fitting.
D. This standard specifies that the standard tolerance is divided into 18 grades.
- Among the following groups of fittings, which fitting is similar in nature ()
A. $\phi 30H7 / f6$ and $\phi 30H8 / p7$ B. $\phi 30P8 / h7$ and $\phi 30H7 / p8$
C. $\phi 30M8 / h7$ and $\phi 30H8 / m7$ D. $\phi 30H8 / m7$ and $\phi 30M7 / h6$

4. Which of the following measurement has the highest measurement accuracy ()
- A. True value: 40mm; measured value: 40.05mm B. True value: 40mm; measured value: 40.02mm
- C. True value: 100mm; measured value: 100.03mm D. True value: 100mm; measured value: 99.5mm
5. The key-width tolerance zone of flat key coupling is h8. In integrated coupling for general mechanical transmission with light loading, the tolerance bands for shaft groove width and hub groove width are ()
- A. Shaft groove: H9; hub groove: D10 B. Shaft groove: N9; hub groove: Js9
- C. Shaft groove: P9; hub groove: P9 D. Shaft groove N9; hub groove: P9
6. If the physical profile of a shaft's cross section is contained by two concentric circles ($\Phi 20.07\text{mm}$ and $\Phi 20.03\text{mm}$) to form an minimum containment zone, then the roundness error of the profile is ().
- A、0.02mm B、0.04mm C、0.015mm D、0.005mm
7. Which of the following statements is true ()
- A. For basic deviation of the shaft, the deviation from a to h is lower deviation ei, and its value is negative or zero.
- B. For basic deviation of the shaft, the deviation from j to zc is upper deviation es, and its value is positive.
- C. The numerical value of basic deviation is not related to tolerance grade.
- D. In general, for holes fitting with reference axis: A ~ H is usually for clearance fit, while P ~ ZC is usually the interference fit.
8. The indexing error of spline is generally controlled by tolerance of ().
- A. Parallelism B. Position degree C. Gradient D. Coaxial degree
9. Factors affecting the movement accuracy of gear transmission ()
- A. Cumulative pitch error B. tangential tooth to-tooth composite error
- C. Base circle pitch deviation D. Tooth-profile total deviation
10. Which of the following measurements is an indirect measurement ()
- A. Measuring outer diameter by micrometer B. Measuring outer diameter by optical comparator
- C. Measuring inner diameter by bore dial indicator. D. Measuring hole pitch by vernier caliper

Score	
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II. Design questions (15 points)

A shaft and a hole are fitted using the basic hole system. Nominal size is $\phi 60\text{mm}$. It is required that $X_{\max} \leq +12\mu\text{m}$, $Y_{\max} \geq -40\mu\text{m}$. Determine the fit symbol, and mark it on the drawings below. In the parts drawing, mark the requirement for dimensional tolerance of shaft and holes.



Score	
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III. Comprehensive problem-solving questions (65 points)

1. The power of the reducer is 4.5kW, the rotating speed of output shaft is 90r/min, and the bearings on both ends are 30211 ($\phi 55$, $\phi 100$) 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)

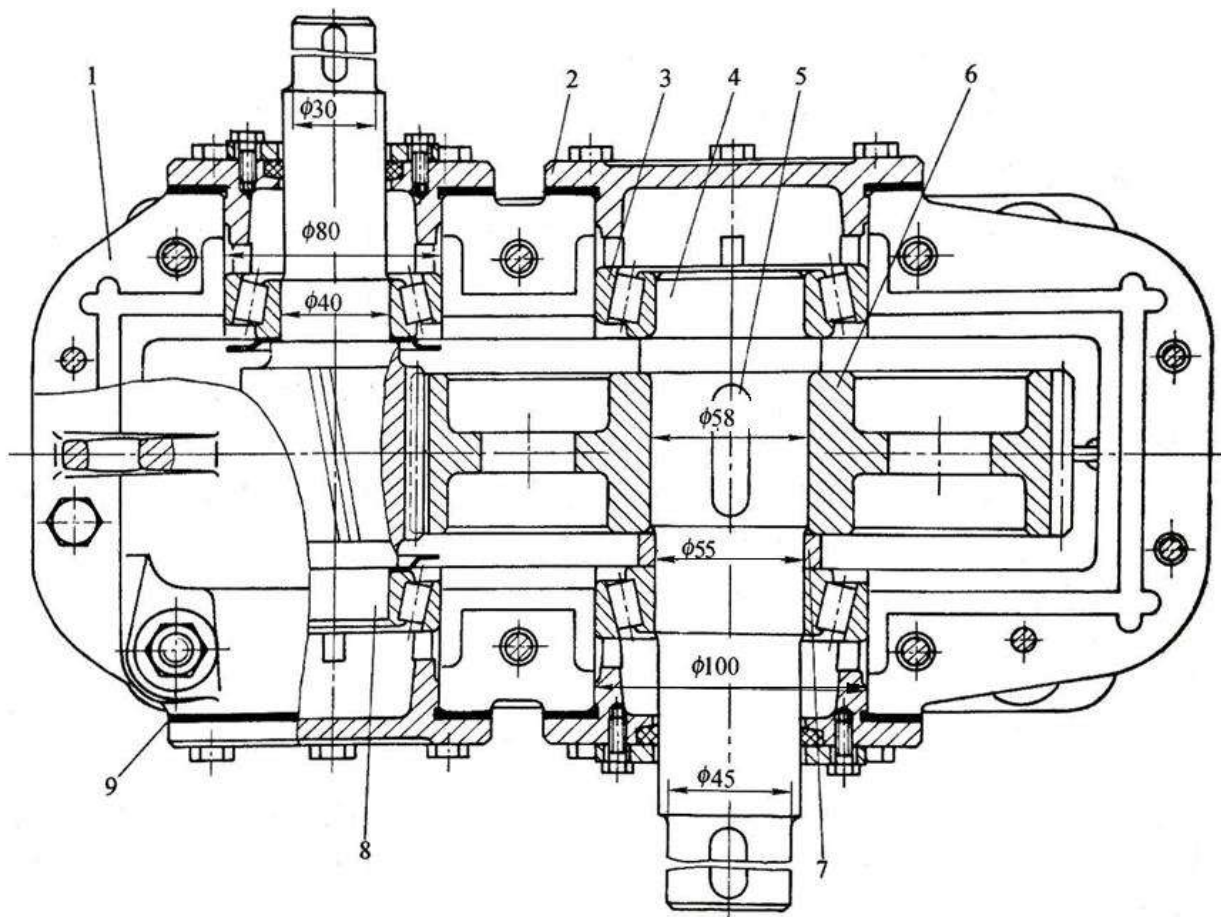


Figure 1

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	$8^\circ6'34''$	
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	k	10
	公称值及 极限偏差	$W \pm \begin{smallmatrix} E_{\alpha n} \\ E_{\beta n} \end{smallmatrix}$	$87.552 \begin{smallmatrix} -0.008 \\ -0.148 \end{smallmatrix}$

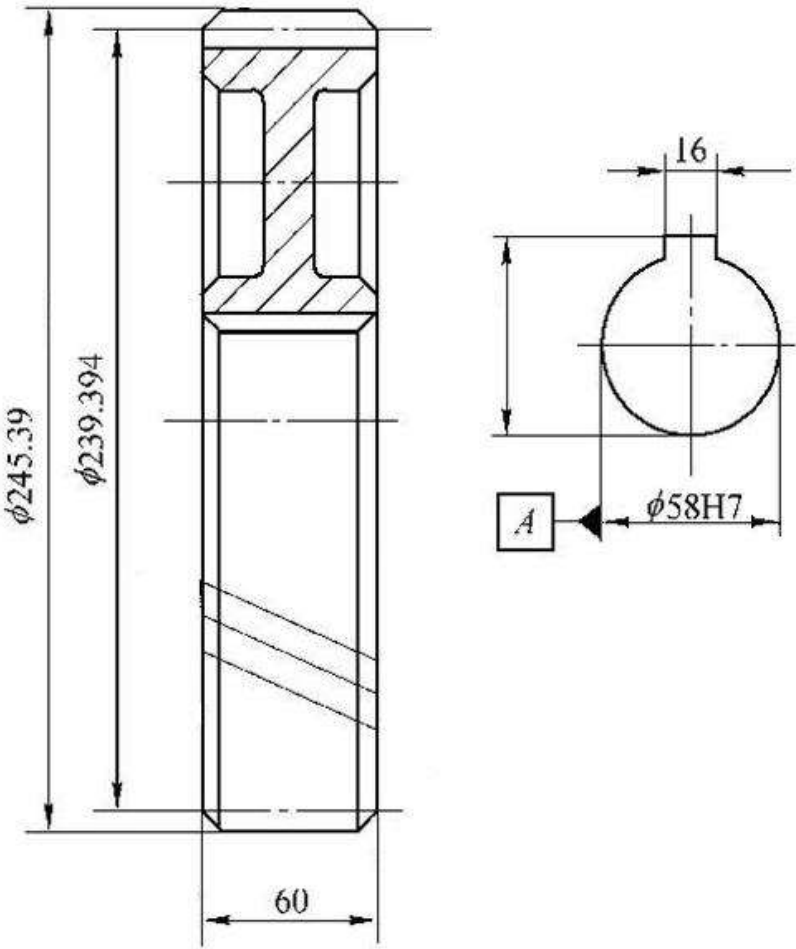


Figure 2

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)

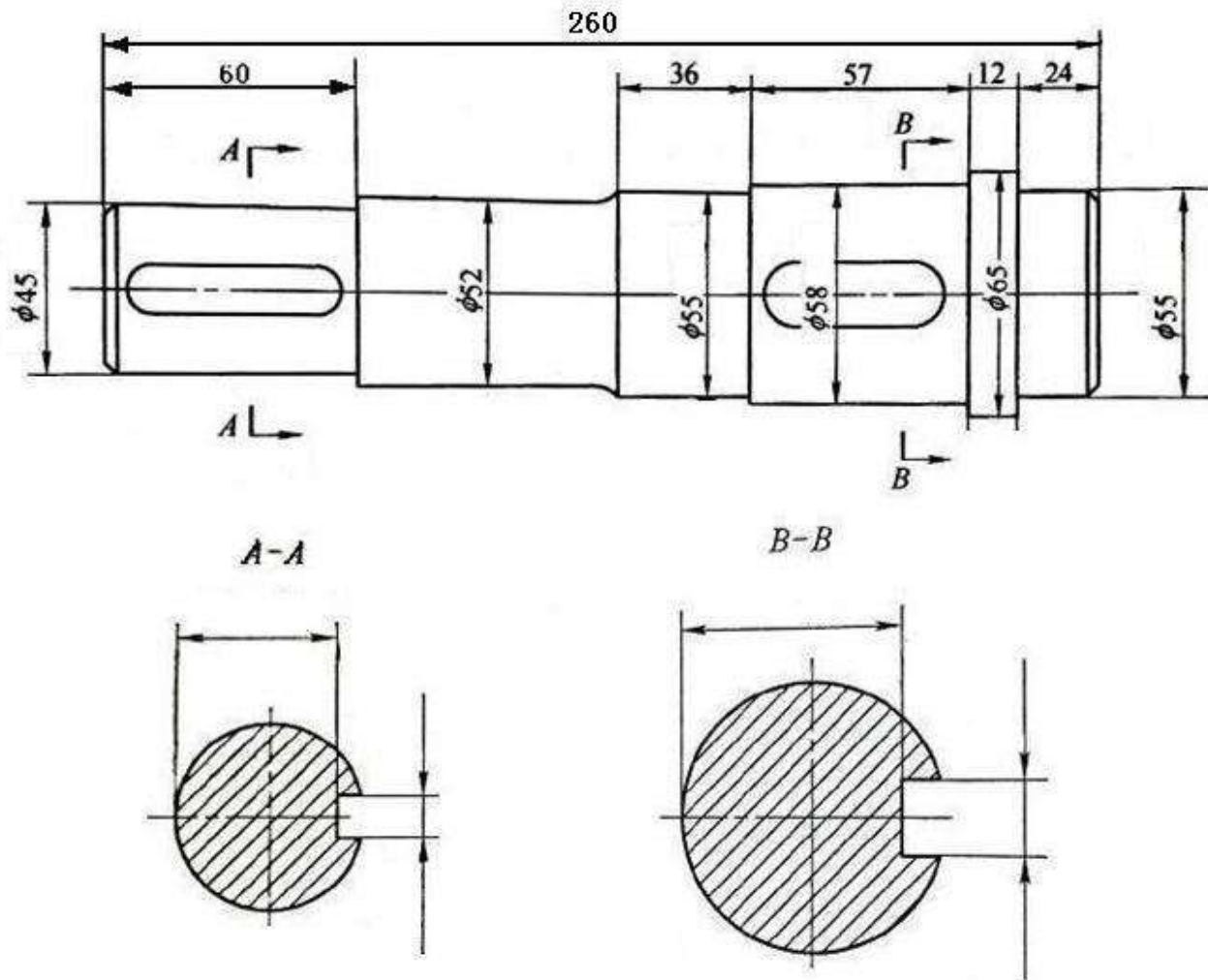


Figure 3