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Question Paper Code: U8766

B.E./B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

One Credit Course

Mechanical Engineering

21UME866 LIMITS, FITS AND TOLERANCES

(Regulations 2021)

Duration: 1.30 Hours

Maximum: 50 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. A hole is drilled with a basic size of 12 mm, but the actual size is found to be 12.15 mm. Determine whether this hole is suitable for a 12 mm pin and propose a solution if necessary. CO1-App
2. A piston and cylinder require a specific clearance to function efficiently. If the clearance is too small, what problems might arise due to thermal expansion, and how can they be prevented? CO1-App
3. A bolt hole is specified to be 10 mm with a unilateral tolerance of +0.05 mm / - 0.00 mm. If the drilled hole is measured as 10.06 mm, determine whether it meets the required tolerance and propose a solution. CO1-App
4. A milling machine table requires a flatness tolerance to ensure smooth workpiece placement. If the surface is not flat within tolerance limits, what machining defects might occur, and how can they be corrected? CO1-App
5. In a machine tool guideway, proper clearance between moving parts is necessary. Explain the impact of excessive clearance on accuracy and suggest corrective measures to improve precision. CO1-App
6. A gear and hub require an interference fit to prevent slippage. If the hole has a H7 deviation and the shaft has an n6 deviation, explain how the fundamental deviation symbols determine the level of interference and suggest how to adjust the fit for high-torque applications. CO 1- U
7. A robotic arm joint requires a fit that allows for smooth movement without excessive play. How would you select the appropriate fit to balance precision, durability, and ease of motion in the joint mechanism? CO1- U

8. A shaft and hole system uses fundamental deviation to determine the actual fit. CO2-App
If a shaft's deviation is negative, explain how it affects the clearance and suggest ways to ensure a proper fit.
9. In precision machining, selecting the wrong fundamental deviation symbol can CO2-App
lead to incorrect assembly. If a designer mistakenly uses a g6 shaft instead of an h6 shaft, evaluate how this change impacts the clearance or interference and propose corrective actions.
10. In die and mold assembly, a transition fit is selected to balance alignment and CO2-App
disassembly convenience. If a part needs to be removed frequently, how should the transition fit be adjusted to ensure both stability and ease of maintenance?

PART – B (2x 15= 30 Marks)

11. (a) The gearbox design specifies a basic size of 40 mm for a shaft CO1- App (15)
and 40.05 mm for a hole. Explain how the basic size serves as the reference for setting the limits and tolerances in this assembly.

Or

- (b) An engineer needs to design a press-fit coupling for a high- CO1- App (15)
torque application. What factors should be analyzed to ensure the fit provides adequate interference without causing assembly issues?

12. (a) A precision shaft needs to be assembled into a hole using the CO2- App (15)
hole basis system. If the hole is manufactured with an H7 tolerance and the shaft tolerance is selected as g6, analyze how this fit affects assembly, performance, and ease of manufacturing. Provide a detailed explanation along with a neat sketch to illustrate the concept.

Or

- (b) 3D-printed mechanical component has a flatness tolerance of CO2- App (15)
0.05 mm for proper assembly. If warping during the printing process causes the surface to exceed this tolerance, how will it affect the assembly, and what post-processing methods can be applied to correct it?