Exam.Code:1016
Sub. Code: 7455

2122

M.E. (Mechanical Engineering)

Third Semester

MME-301: Advanced Machine Design

Time allowed: 3 Hours

Max. Marks: 50

***NOTE**: Attempt <u>five</u> questions in all, selecting atleast two questions from each Unit. Assume suitably the missing data, if any. Supplement your answer with neat and labeled sketches wherever required.*

x-x-x

UNIT - I

1. Describe at least three applications for each of the following: (10)
   Clearance fit
   Transition fit
   Interreference fit

2. Create an estimated SN diagram for an aluminium bar and define its equations. What is the corrected fatigue strength at 2E7 cycles? Ultimate tensile strength for this material is 45000 psi. The forged bar is 1.5 in round. The maximum operating temperature is 300°F. The loading is fully reversed torsion. A reliability factor of 99% will be used. The uncorrected fatigue strength will be taken as 5E8 cycles. (10)

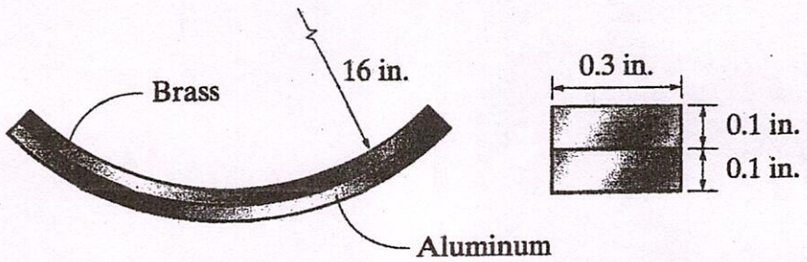
3. Two contacting rollers are needed for a machine application. They run together with the combination of rolling and 9% sliding. Both are to be made from SAE 1144 cold-rolled steel. The radial contact force is 1200 N and the coefficient of friction is 0.33. The rollers are to have the same radii and are both 10 mm long. If the design life is 8E8 cycles, design a suitable radius for the rollers. (10)

4. Determine the number of active coils required for a helical spring with a wire diameter of 6 mm, mean-coil diameter of 50 mm, with a body of 5 kg mass at one end, struck at the other by a body of 50 kg mass at 3.5 m/s. The allowable shear stress is 550 MPa. (10)

UNIT - II

5. Design an undamped SDOF spring-mass system to have natural frequency of 100 Hz having a mass of 1 kg. How will the design output be affected if damping is also considered? (10)

6. A bimetallic strip is made from pieces of 2014-T6 aluminum and C83400 red brass, having the cross section shown in next figure. A temperature increase causes its neutral surface to be bent into a circular arc having a radius of 16 in. Determine the moment that must be acting on its cross section due to the thermal stress. (10)



7. Design an Accelerated Life Testing plan applicable for an electric motor. How can this be useful in deciding warranty period for the electric motor? (10)

8. Name at least three softwares which can be used to solve response surface method (RSM) based numerical optimization problems. Demonstrate the use of Coded variables in RSM by designing a suitable numerical example. (10)

x-x-x