2124
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 Section. Assume suitably the missing data. All questions carry equal marks.

x-x-x

Section – A

1. a) Describe the function of computers in the design process in detail. Also, compare CAD and Conventional Designs processes.

    b) Discuss the term "Factor of Safety" in brief and why it matters in design.   (6, 4)

2. Construct an estimated **S-N diagram** for a steel bar and define its equations also. How many cycles of life can be expected if the alternating stress is **100 MPa**. The ultimate tensile strength has been tested at **600 MPa**. The bar is **145 mm** square and has a hot-rolled finish. The operating temperature is **495°C** maximum. The loading will be fully reversed bending. Assume that infinite life is required and is obtainable since this ductile steel will have an endurance limit. Also, assume the reliability factor of **99.9%**. Assume any necessary data required.

3. As shown in the **Figure 1**, the weight W_1 strikes W_2 from a height h. If $W_1 = 40$ N, $W_2 = 400$ N, $h = 200$ mm, and $k = 32$ kN/m, find the maximum values of the spring force and the deflection of W_2. Assume that the impact between W_1 and W_2 is *inelastic*, ignore the mass of the spring, and solve using **energy conservation**.
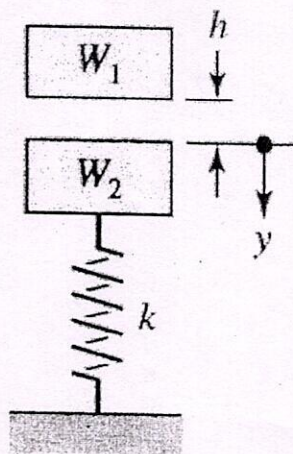
Fig. 1

4. a) Discuss the effect of roughness, velocity, rolling and lubrication on Friction in brief.

   b) Summarize the measures a designer should take to mitigate the probability of Surface Failure. (5, 5)

Section – B

5. Explain Structural Dynamic Modification (SDM) and also discuss the key steps in SDM of drilling machine.

6. a) Explain the Creep phenomena and its different stages as well in brief.

   b) Why Creep and Stress Relaxation are crucial in thermal based designs. (5,5)

7. a) Discuss Accelerated Life Testing (ALT) in detail using an example.

   b) Write a short note on Weibull model and its applications. (5,5)

8. a) What is the objective of using Response Surface Method.

   b Which software is employed for RSM and enumerate the conditions under which RSM is applied.

) Explain in brief the procedure for using RSM using an appropriate example.

   (2,3,5)

x-x-x