Exam.Code:1016
Sub. Code: 7772

1079

M.E. (Mechanical Engineering)
Third Semester
MME-301: Advanced Machine Design

Time allowed: 3 Hours

Max. Marks: 50

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

x-x-x

Part-A

1 Draw and explain at least ten types of loadings applicable in machine design. (10)

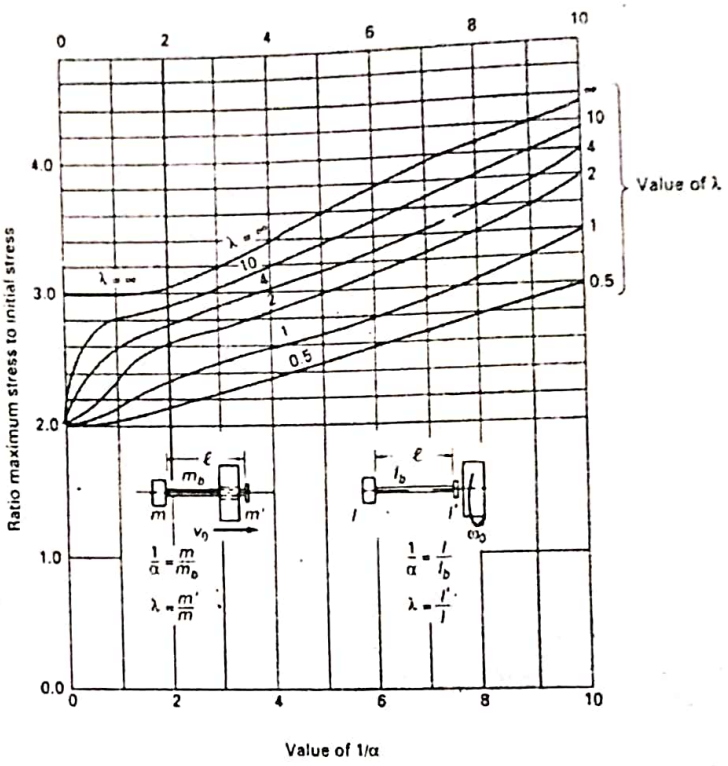
2 Design and draw an estimated SN Diagram for an aluminium bar and define its equations. What is the corrected fatigue strength at 2E7 cycles? Assume S_{ut} as 45000 psi. The forged bar is 1.5 in round. The maximum operating temperature is 300°F. The loading is fully reversed torsion. Reliability factor of 99.0% is needed. Uncorrected fatigue strength can be taken as 5E8 cycles. (10)

3 A crowned cam roller-follower has a gentle radius transverse to its rolling direction to eliminate the need for critical alignment of its axis with that of the cam. The cam's radius of curvature and dynamic load vary around its circumference. What is the size of the contact patch between cam and follower and what are the worst-case stresses? The roller radius is 1 in with a 20-in crown radius at 90° to the roller radius. The cam's radius of curvature at the point of maximum load is 3.46 in and it is flat axially. The rotational axes of the cam and roller are parallel, which makes the angle between the two bodies zero. The force is 250 lb, normal to the contact plane. Materials are steel. The relative motion is rolling with <1% sliding. (10)

4 A steel flywheel consists of a disk 700 mm in diameter and 150 mm thick. While rotating at 300 rpm, it engages a stationary shaft 100 mm in diameter and 2 m long through a jaw clutch. At its far end there are gears with an equivalent moment of inertia of 0.10 kg-m^2. Design the flywheel considering the impact loading conditions. (10)

P.T.O.

(2)



Part-B

5 Write a MATLAB program for Baruch and Bar-ltzhack method based finite element model updating of a mechanical two degree-of-freedom spring-mass system. (10)

6 What are effects of short term and long term properties of materials on design? (10)

7 Extensive accelerated life experiments were conducted by subjecting capacitors to temperatures of 150, 250, and 350°C. Mean failure times of capacitors were found to be 9000, 5000 and 1000 at 150, 250, and 350°C respectively. Determine the mean time to failure (MTTF) of the capacitors at 25°C and plot the reliability function. (10)

8 Fit a response surface model to following set of experimental readings:

Input 1	Input 2	Output 1
10	10	22
20	20	41
30	30	59
40	40	78
25	25	48
25	25	51
25	25	49
25	25	53
25	25	47

(10)

x-x-x