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	B. Tech. VI Sem. (Main/Back) Exam., May. 2013	
	Mechanics of Materials 6ME1 Design of Machine Elements-II (COMMON For ME, AE, PI)	

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. Design Data Book

2. Calculator

UNIT - I

Q.1. (a) Explain what is meant by Stress Concentration? How it can be reduced by suitable design Practice. [8]

(b) A rod of a linkage mechanism made of steel 40 Cr1 ($S_{ut} = 550 \text{ N/mm}^2$) is subjected to a completely reversed axial load of 100 kN. The rod is machined on a lathe and the expected reliability is 95%. There is no stress concentration. Determine the diameter of the rod using a factor of safety of 2 for an infinite life condition. [8]

OR

Q.1. (a) Explain the difference between Gerber Curve, Goodman line and Sodaberg line. [8]

- (b) A polished steel bar is subjected to axial tensile force that varies from zero to P_{\max} . It has a groove 2mm deep and having a radius of 3mm. The theoretical stress concentration factor and notch sensitivity factor at the groove are 1.8 and 0.95 respectively. The outer dia of the bar is 30 mm. The ultimate tensile strength of the bar is 1250 MPa. The endurance limit in reversed bending is 600 MPa. Find the maximum force that the bar can carry for 10^5 cycles for 90% reliability.[8]

UNIT – II

- Q.2. (a) What are the different factors used in calculation of endurance strength of a bolt subjected to fluctuating loads. [8]
- (b) Two copper plates of thickness 30mm each are joined by a steel bolt M14 with $\sigma_p = 650\text{MPa}$. Initial preload on bolt = $0.75\sigma_p \times A_t$ where A_t is tensile stress area of bolt. How much external load can be safely applied on the assembly of plates and bolts? Take washer thickness = 3mm. If torque co-efficient $K=0.2$, what is the initial tightening torque on nut. [8]

OR

- Q.2. The lead screw at a lathe has single start ISO metric trapezoidal threads of 52mm nominal diameter and 8mm pitch. The screw is required to exert an axial force of 2kN in order to drive the tool carriage during turning operation. The thrust is carried on a collar of 100mm outer dia and 60 mm inner diameter. The values of coefficient of friction at the screw threads and the collar are 0.15 and 0.12 respectively. The lead screw rotates at 30 rpm. Calculate
- (i) The power required to drive the lead screw
- (ii) The efficiency of screw. [16]

UNIT – III

- Q.3. (a) What is helical torsion spring? How does it differ from helical compression spring. [6]

UNIT – V

Q.5 (a) Give applications of the following solid film lubricants:-

- (i) Molybdenum disulphide
- (ii) Lead Oxide
- (iii) Boric acid
- (iv) Graphite

[8]

(b) Why is hydrodynamic journal bearing called “Self Acting bearing”?

[8]

OR

Q.5. A hydrostatic thrust bearing consists of 4 pads. Each pad can be approximated by a circular area of 250 mm & 100mm outer and inner diameters respectively. Thrust load is 400 kN and film thickness is 0.15 mm. Viscosity and Specific gravity of lubricating oil are 200 SUS and 0.86 respectively. Calculate supply pressure & flow requirement.

[16]