

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain squeeze film lubrication.  
(b) Find the "Rating Life" of the 50 mm bore, light series ball journal bearing under 6800 N radial load at 60 r.p.m. The load is out of balance and therefore rotates with inner ring. There is no shocking load.

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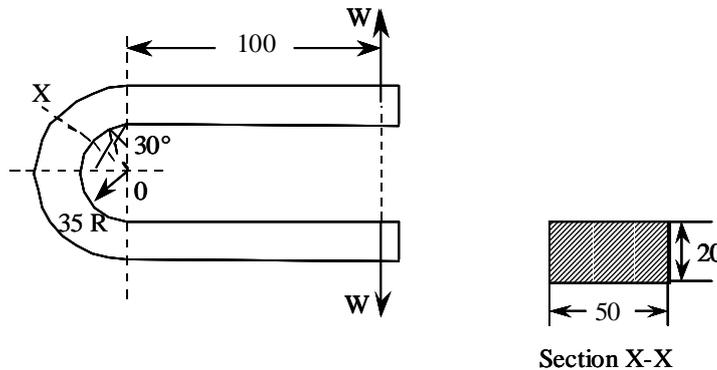
2. (a) Explain the different parts of a trunk piston. Explain with figure.  
(b) Explain cylinder liner distorting and cylinder lubrication.

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3. (a) What are the methods and materials used in manufacturing crank shaft?  
(b) Explain any one method with neat sketch.

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4. Determine the stresses at section X-X of the punch as shown in figure  $W = 2$  kN.



Section X-X

5. Derive  $\frac{T_1 - mv^2}{T_2 - mv^2} = e^{\frac{\mu \alpha}{\sin(\theta/2)}}$  for a V belt, where  $T_1$  and  $T_2$  are the tensions in the belt and "m" mass of 1 m belt,  $\mu$  coefficient of friction,  $\alpha$  angle of wrap. State the assumptions clearly.

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6. A cast steel spur pinion ( $\sigma_d = 200$  MPa) running at 450 r.p.m transmits 20 kW power to a cast iron gear ( $\sigma_d = 80$  MPa) running at approximately 112 r.p.m. the load is steady, design the drive and check for dynamic and wear loads.

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7. A semi-elliptical laminated vehicle spring to carry a load of 8000 N is to consist of seven leaves 75 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1 m in length and attached to the axle by two U-bolts 80 mm apart. The bolts hold the central portion of the spring so rigidly that they may be considered equivalent to a band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine,

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- (i) Thickness of leaves
  - (ii) Deflection of spring
  - (iii) Diameter of eye
  - (iv) Length of leaves and
  - (v) Radius to which leaves should be initially bent.
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8. (a) Show that the efficient of self locking screws is less than 50 percent.
- (b) What is self locking property of threads and where it is necessary?