

III B.Tech II Semester Supplementary Examinations, January 2005
DESIGN OF MACHINE MEMBERS-II

(Common to Mechanical Engineering and Production Engineering)

Time: 3 hours**Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the desirable properties of bearing materials?
(b) A hydrodynamic full journal bearing is to carry a load of 25 kN at a speed of 3000 rpm. The journal diameter is 150 mm and the length of bearing is 75 mm. SAE 30 oil is used with an average operating temperature of 55°C. If the radial clearance is 0.075 mm, calculate the power loss, the side leakage and the minimum film thickness.
2. (a) What are the types of rolling contact bearings? Explain in brief.
(b) A ball bearing for drilling machine spindle is rotating at 3000 rpm. It is subjected to a radial load of 2500 N and an axial thrust of 1500 N. It is to work 50 hours per week for one year. Design a suitable bearing if the diameter of the spindle is 40 mm.
3. Design a connecting rod for a double acting steam engine having 500mm cylinder diameter and 750 mm stroke. The piston is subjected to a maximum pressure of 200 N/sq mm. The length of the connecting rod is 1500 mm. connecting rod is made of 20Mn. steel with a factor of safety 2 on Endurance limit.
4. (a) Under what forces the big end bolt and caps are designed?
(b) Why I-section is selected for high-speed I.C engines?
(c) What is the usual ratio of connecting rod length and stroke of piston? How it is decided upon.
5. The maximum connecting rod force on a steam engine running at 90 rpm is 70 KN. Determine the necessary size of the over hanging crank pin. Determine the diameter of the crankshaft journal if the stroke is 0.90 m and distance between centerline of bearing and pin is 0.36 m.
6. A helical spring B is placed inside the coils of a second helical spring A, having the same number of coils and free length. The springs are made of the same material. The composite springs is compressed by an axial load of 2300 N which is shared between them. The mean diameters of the spring A and B are 100 mm and 70 mm respectively and wire diameters are 13 mm and 8 mm respectively. Find the load taken and the max. stress in each spring.
7. Two shafts whose centers are 1 metre apart are connected by a V-belt drive. The driving pulley is supplied with 95kW power and has an effective diameter of 300mm. It runs at 1000 r.p.m. while the driven pulley runs at 375 r.p.m. The angle of groove

on the pulleys is 40° . Permissible tension in 400 mm² cross-sectional area belt is 2.1 MPa. The material of the belt has density of 1100 kg/m³. The coefficient of friction between belt and pulley rim from the nearest bearing being 200mm. The coefficient of friction between belt and pulley rim is 0.28. Design a suitable V-drive for the above data.

8. In a spur gear drive for a rock crusher, the gears are made of case hardened alloy steel. The pinion is transmitting 18 kW at 1200 rpm with a gear ratio of 3.5. The gear is to work 8 hours/day for 3 years. Design the drive.
