

Roll No.

Total No. of Pages : 3

Total No. of Questions : 09

B.Tech. (Sem.-6)
AUTOMOTIVE DESIGN-II
Subject Code : AE-302
Paper ID : [A0719]

Time : 4 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY.**
2. **Attempt any FOUR questions from SECTION-B.**
3. **Attempt any TWO questions from SECTION-C.**
4. **Use of only P.S.G. design data book is permitted.**
5. **Assume missing data suitably, if any.**

SECTION-A **(10 × 2 = 20 Marks)**

1. (a) What are the methods and materials used in manufacturing of crankshafts?
(b) What are the applications of hauling chains?
(c) What is offset link of roller chain?
(d) What is load correction factor for flat-belt?
(e) What is belt rating?
(f) How is axial thrust in helical gears overcome?
(g) What is crossed helical gear?
(h) State any two advantages of deep groove ball bearing.
(i) Why taper roller bearings are used in a pair?
(j) What is thick film lubrication?

SECTION-B **(4 × 5 = 20 Marks)**

2. Discuss different types of wear failure and breakage failure of gear tooth due to static and dynamic loads.
3. Discuss advantages and drawbacks of worm gear drives. Suggest materials for worm wheel and worm with proper justification.

4. The load on the journal bearing is 180 kN due to turbine shaft of 300 mm diameter running at 2000 rpm. Determine the following:
- Length of the bearing if the allowable bearing pressure is 1.6 N/mm^2 , and
 - Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60°C and viscosity of the oil is 0.02 kg/m-s and the bearing clearance is 0.25 mm.
5. Give step-by step procedure for the selection of flat belt from manufacturer's catalogue for given application. Provide all other information and recommendations needed in selection.
6. A pair of worm and worm wheel is designated as 3/60/10/6.
- The worm is transmitting 5kW at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the normal pressure angle is 20° . Determine the lead angle, torque and component of gear tooth forces acting on the worm and worm wheel.

SECTION-C **(2 × 10 = 20 Marks)**

7. A pair of spur gears with 20° full-depth involute teeth consists of a 20 teeth pinion meshing with 41 teeth gear. The module is 3 mm while the face width is 40mm. The material for the pinion as well as for the gear is steel with an ultimate tensile strength of 600 N/mm^2 . The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the surface factor for the application is 1.75. Assume the velocity factor accounts for the dynamic load, and the factor of safety is 1.5. Determine wear strength, effective load, torque, beam strength and rated power of gears. Assume lewis form factor as 0.32 for 20 teeth.
8. A V-belt drive is required for a 15 kW, 1440 rpm electric motor, which drives a centrifugal pump running at 360 rpm for a service of 24 hours per day. From space considerations, the centre distance should be approximately 1m. Determine :
- Belt specifications
 - number of belts
 - correct centre distance, and
 - pulley diameters

9. A concentric spring is used as valve spring in a heavy duty diesel engine. It consists of two helical compression springs having the same free length and same solid length. The composite spring is subjected to a maximum force of 6000 N and the corresponding deflection is 50 mm. The maximum torsional shear stress induced in each spring is 800 N/mm^2 . The spring index of each spring is 6. Assume same material for two springs and the modulus of rigidity of spring material is 81370 N/mm^2 . The diametrical clearance between the coils is equal to the difference between their wire diameters. Calculate:
- (a) The axial force transmitted by each spring
 - (b) Wire and mean coil diameter of each spring
 - (c) Number of active coils in each spring