Total No. of Questions :10]

SEAT No. :

P2842

[Total No. of Pages :5

[4958] - 1016

T.E. (Mechanical)

DESIGN OF MECHINE ELEMENTS - II

(2012 Course) (End Semester) (302048) (Semester - II)

Time : 3 Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer five questions from following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain the following **[4]**

i) Hunting tooth

ii) Crowning of Gear tooth

b) Following data refers steel spur gear pair transmitting 5 kW power running at 3000 rpm to a machine at. 1500 rpm. Module - 4 mm, No. of teeth or pinion - 18 S_{ut} for pinion & Gear - 630 N/mm^2, face width - 10 m Surface Hardness - 400 BHN. Tooth system - 20° full dept involute. Deformation factor c = 171 N/mm. Assume dynamic load accounted by Buckingham's equation calculate **[6]**

i) Factor of safety in bending

ii) Factor of safety in pitling

Use following data-

- Y = 0.484 - 2.87/z
- k = 0.16 [BHN/100]^2
- $Pd = \dfrac{21v\left(bc + pt\max\right)}{21v + \sqrt{bc + pt\max}}$

OR

P.T.O.

Q2) a) Explain **[6]**

i) Methods of estimation of dynamic load for spur gear.

ii) Gear tooth failures

b) A helical gear pair 20° full depth tooth profile consists of 18 teeth pinion meshing with 36 teeth gear. The pinion & gear is made of with same material. With S_{ut} - 600 N/mm^2 module - 5 mm, face width - 10×module. helix angle 23°. BHN for pinion and gear - 280, factor of safety - 2. Pinion speed - 1440 rpm. Calculate **[4]**

i) Beam strength

ii) Wear strength

use following data -

Y - 0.484 - 2.87/z^1

V - 5.6/5.6 + $\sqrt{v}$

Q3) a) Differentiate spiral bevel with hypord gear. **[2]**

b) A cylindrical Rollar bearing is subjected to radial load of 5000 N. Life of bearing with 90% reliability is 15000 hrs. The application factor is 1.5 if the share rotates at 1440 rpm calculate the required basic dynamic load rating of bearing. **[8]**

OR

Q4) a) Draw the free body diagram for components of gear tooth forces, when pinion rotates clockwise direction when seen from left. Assume pinion having right hand threads and is below the helical gear. **[2]**

b) With neat sketch explain mounting of taper rollar bearing. Write designation of bearing no. - 6307. **[8]**

Q5) a) Derive an expression for components of force acting on worm and worm gear. **[4]**

b) A worm transmits 3 kW power at 1440 rpm and drives a gear having 60 teeth. The pitch circle diameter of worm is 90 mm and triple threated the module of worm gear is 4 mm. The worm is right handed and rotates in clockwise direction when seen from left. Assume worm 1.5 above the worm wheel. Calculate

i) Components of tooth foreces

ii) Efficiency of drive

Also sketch the arrangement showing the component of toothforces. **[10]**

c) Write a short note on thermal considertion in worm gear. **[4]**

OR

Q6) a) Why worm and worm wheel are made of disimilar material? **[3]**

b) In design of worm gear, why worm gear governs the design. **[3]**

c) A pair of worm and worm wheel is designated as 2/72/10/6. The worm is transmitting 8 kW at 1800 rpm to a worm wheel. The permissible bending strength is 110 N/mm^2. The wear load factor is 0.83 N/mm^2. The coefficient of friction is 0.05 and normal pressure angle is 20°. Find **[12]**

i) Factor of safety in bending

ii) Factor of safety in wearing

iii) Factor of safety in heal dissipation.

Use following data,

- $Y = 0.484 - \frac{2.85}{Z}$
- Barth Factor $Cv = \frac{6}{6+V}$
- Input $kW = \frac{a^{1.7}}{34.5\,(i+5)}$

Where a - centre distance

i - gear ratio.

Q7) a) A pulley of 1000 mm diameter is driven by an open type flat belt from 25 kW. at 1440 rpm. electric motor. The pulley on the motor shape is 250 mm diameter and center distance between two shapes is 2m. The alloweble tensile stress for belt material is 2 N/mm^2 and coeffiant of friction between belt and pulley is 0.28. The density of belt meterial is 900 kg/m^3. If the width of belt is 125 mm determine, **[12]**

i) Thickness of belt

ii) Length of belt

iii) Initial tension required in belt

b) Discuss creep in belt with neat sketch. **[4]**

OR

Q8) a) Discuss the stresses developed in wire rope. **[4]**

b) Explain the procedure of selection of V - belt from manufacturing catalogue. **[6]**

c) Discuss modes of failures for chain. **[6]**

Q9) a) Explain design variables and performance variables of hydrodynamic journal bearing. **[6]**

b) The following data is given for a 360° hydrodynamic journal bearing, radial load - 6.5 kN, journal speed - 1200 rpm, journal diameter - 60 mm, bearing length - 69 mm. minimum oil film thickness 0.009 mm. The fit between journal and bearing is normal fit H_7e_7 for which hole diamter is $60^{+0.00}_{+0.03}$

and shape diameter $60^{-0.06}_{-0.09}$

specilty the viscosity of lulmicating oil for given journal bearing. **[10]**

OR

Q10)a) With neat sketch show axial & radial pressure distribution in hydrodynamic journal bearing. **[5]**

b) A hydrodynamic journal bearing is to be designed to support a radial load of 5 kN. The l/d ratio to be considered is 0.4. The journal rotates at 5040 rpm. The eccentricity ratio is 0.6. If central lubrication supplies lubricating oil of viscosity 46 C. Poise (cP) at flow rate of 0.5 1it/min to bearing. Calculate **[11]**

i) Diameter of journal

ii) Radial clearence

iii) Dimensions of Bearing

iv) Minimum oil film thickness.