B.E. (Mechanical) (Sem-VII) (CBS)

Paper / Subject Code: 42851 / Machine Design II Date - 14/11/2019

(Time: 3 Hours) **Marks: 80**

N.B. 1) **Question No. 1 is compulsory**
2) Solve **Any Three** from remaining **Five** questions.
3) Use of standard data book is permitted
4) Assume suitable data if necessary, giving justification

Q1 Answer any **Four** from the following

a)	What is meant by bevel gear factor? Explain the terms in the expression of bevel gear factor?	**5**
b)	Explain the importance of hunting tooth in gear trains?	**5**
c)	Why is pre loading required in anti-friction? Give example of applications of pre-loaded bearings?	**5**
d)	How does lubrication help in preventing gear failure?	**5**
e)	Explain the terms coefficient of speed fluctuation and coefficient of steadiness?	**5**

Q2 a) A rotary disc cam and central translator follower has following motion:-
Forward stroke = 30 mm in 100° rotation of cam with Parabolic motion and Return stroke = 30 mm with SHM in 90° of cam rotation remaining dwell for the remaining period.
Mass of follower is 1.5 Kg and cam shaft rotates at 650 rpm and maximum pressure angle is 25° during forward stoke. The external force is 200 N during forward stroke and 50 N during return stroke.
Determine

1. Design the cam, the roller follower along with its pin and spring **12**
2. Calculate maximum cam shaft torque. **03**

Q2 b) State assumptions made in Beam strength equation? **05**

Q3 a) A V- belt drive is required for a 15KW, 1440rpm electric motor, which drives a centrifugal pump running at 360 rpm for a service of 24 hr per day. From space considerations, the centre distance should be approximately 1 m. Determine

1. Belt specification **3**
2. Number of belts **3**
3. Correct centre distance **2**

Q3 b) Design a CI flywheel for four stroke IC engine developing 50 HP at 300 rpm. The total fluctuation of speed is limited to 3% of mean speed. The work done during power stroke is 30% more than the average work done during the whole cycle. Find the diameter of shaft supporting the flywheel. **12**

Q4 a) A pair of parallel helical gears consists of 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720rpm. The normal pressure angle is 20° while the helix angle is 25°. The face width is 40 mm and normal module is 4mm. The pinion and gear is made up of plain carbon steel with ultimate tensile strength of 600 N/mm^2 and heat treated to surface hardness of 300 BHN. Calculate power transmitting capacity based on strength and wear for service factor of 1.5 **12**

Q4 b) An angular contact ball bearing is used for worm gear shaft to support a radial load of 8 KN and 4.5KN along the axial direction. The shaft rotates at 30 rpm. Select suitable size of bearing if it is required to have a life of 30000 hrs with a probability of survival of 92% **08**

Q5 a) A worm reduction unit is required to transmit 15KW power from an electric motor operating at1440 rpm. The output speed is 75 rpm and the load is mild shock, normal duty.

i) Selecting suitable material and stresses design worm and worm wheel for strength and wear. **8**

ii) Check the unit for heat dissipation capacity and modify the dimensions if necessary **7**

Q5 b) Why clutches are usually designed on the basis of uniform wear? **5**

Q6 a) A 180 ° hydro dynamically lubricated journal bearing supports a radial load of 10 KN when operating at 750 rpm for an air blower. The radius to radial clearance is 1000 and SAE 20 oil is used for lubrication. Design the bearing and check its operating parameters like oil flow rate, Temperature, Bearing surface temperature, Coefficient of friction and frictional power loss. **15**

Q6 b) Why are ball and roller bearings called 'antifriction' bearing **5**

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