MANIPAL INSTITUTE OF TECHNOLOGY
A Constituent Institute of Manipal University, Manipal

VI SEMESTER B.TECH (MECHANICAL ENGG.) END SEMESTER EXAMINATIONS, JUNE 2017

SUBJECT: MECHANICAL DESIGN – II [MME 3202]
REVISED CREDIT SYSTEM

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.
❖ Missing data may be suitably assumed.
❖ Use of Design data hand book is permitted

1A. Prove that bending stress in full length leaves is 50% more than the stress in graduated leaves. **(05)**

1B. Design a helical compression spring to carry a load of 500 N with a deflection of 20 mm. The allowable shear stress in the spring material is 350 MPa and modulus of rigidity is 82.7×10^3 MPa. The spring index is 6. **(05)**

2A. A pair of continuously lubricated helical gears is to transmit 15 kW at 5000 rpm of the pinion. Both the gears are made of cast steel (untreated). The centre distance is approximately 200 mm. The velocity ratio is 4:1. The teeth are of 20° full depth involute profile. The helix angle is 45°. Take face width as 15 times the normal module. The gears are subjected to medium shock with 10 hrs / day of service. Design the gears based on strength. Also calculate wear load for given load stress factor K=0.420. **(05)**

2B. List out the assumptions and derive an expression for beam strength of a spur gear with standard notations. **(05)**

3A. A pair of right angle bevel gears transmits 20 kW of power at 780 rpm of pinion. The velocity ratio is 3.5:1. The module and face width are 6 mm and 60 mm respectively. The teeth are of $14\frac{1}{2}^0$ involute profile. The number of teeth on the pinion is 32. The gears are subjected to light shock with 8 hrs/day of service. The material for pinion is C40 steel and material for gear is **(05)**

untreated forged steel. Calculate the dynamic load and determine the minimum necessary hardness to withstand wear load.

3B. Explain how the efficiency and self-locking in a worm gear drive is related to the number of starts. **(03)**

3C. Define the following **(02)**

    a) Lead angle b) diametral quotient

4A. A bearing 0.05 m in diameter and 0.075 m in length supports a shaft running at 900 rpm.The room temperature is 32^0 C and the bearing temperature is 82^0 C. The viscosity of the oil used is 0.0128 Ns/m^2. The diametral clearance is 0.05 mm and the bearing is to operate in still air without any artificial cooling. Determine **(05)**

    a) The permissible load on the bearing.

    b) Power loss.

4B. Define the following with respect to rolling contact bearing. **(05)**
    a) Life of a bearing
    b) Median life
    c) Static load carrying capacity
    d) Dynamic load carrying capacity
    e) Rating life

5A. Select a V belt drive to transmit 5 kW from a normal torque AC motor running at 1500 rpm to a light duty compressor running at approximately 970 rpm. The groove angle is 34^0 .The power rating of belt is 2.65 kW. The centre distance is approximately 600 mm. The allowable fluctuation of speed of driven pulley is 20 rpm. **(05)**

5B. State the advantages and disadvantages of chain drive over belt drive. **(03)**

5C. Mention two important design rules in a chain drive. **(02)**