Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH (MECHANICAL ENGG.) END SEMESTER EXAMINATIONS, JUNE 2019

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 stresses in graduated leaves. (05)

1B. A helical compression spring is used for a spring loaded safety valve for the following data: (05)

Operating pressure	= 1 MPa
Maximum pressure when the valve blows off freely	= 1.1 MPa
Maximum lift of valve when the pressure is 1.1 MPa	= 6 mm
Modulus of rigidity	= 84 GPa
Spring Index	= 5.5
Diameter of valve seat	= 100 mm
Maximum Shear stress	= 360 MPa
Assume, in a spring, total axial gap is 15% of maximum deflection of the spring	
Take Square and ground type of end	

Determine (i) Wire Diameter (ii) mean coil diameter (iii) number of active coils (iv) free length.

2A. Design a pair of spur gears transmit 20 kW of power while operating for 8-10 hrs per day sustaining medium shock, from a rotating shaft at 1000 rpm to a parallel shaft which is to rotate at 310 rpm. Assume number of teeth on pinion to be 31 and 20^0 involute tooth profile. The material of the pinion is C 40 (07)

steel untreated and for gear is cast steel 0.2% C untreated. Calculate the dynamic load if dynamic load factor C =522.464 N/mm and check for wear load taking wear load factor =0.279 N/mm^2. Suggest suitable hardness. Take service factor 1.5. Assume face width as 10 times the module.

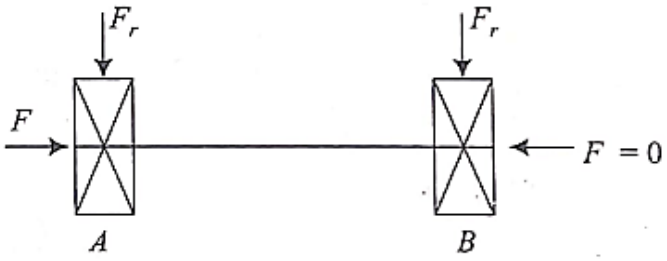
2B. Explain formative number of teeth on helical gear with a neat sketch **(**03)

3A. A pair of bevel gears is used to transmit 11 kW at 500 rpm of the pinion. The shaft angle is 60^0 and speed reduction is 3:1.The teeth are having 20^0 full depth involute profile and the number of teeth on the pinion is 18. The pinion is made of steel C40 untreated and gear is made of untreated cast steel. The load is steady & service is continuous. Take the face width as 8 times the module. The teeth are of generated type. Design the gears based on Lewis equation. (05)

3B. Explain the self-locking and reversible conditions in a worm gear drive. (03)

3C. Justify the material selection for worm and worm wheel. (02)

4A. A transmission shafting is supported on two bearings A and B, 300 mm apart as shown in figure. The bearing 'A ' receives a 2000 N and a thrust load of 1000 N while bearing B receives a radial load of 3000 N. The life may be computed based on working condition of 10 hours/day, 5 days week for 2 years. The shaft rotates at 1000 rpm. The shaft diameter based on strength is 35 mm. Select suitable ball-bearings for shaft at A and B. (05)



4B. Explain with the sketch the theory of hydrodynamic lubrication (05)

5A. Select type of V belt and number of belts required for 10 kW, 750 rpm induction motor to drive an exhaust fan in a steel plant at 250 rpm. The center distance between shafts is 1.2 m (approx.). Pitch diameter of motor pulley is 200 mm. (04)

5B. Select a suitable size of a wire rope to lift a cage of a vertical mine hoist 500 m deep. The cage weighs 15 kN and has to lift a load of 25 kN of ore at acceleration of 1 m/s^2. The pulley diameter may be assumed as 80 times the diameter of rope. (04)

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