Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institute of Manipal University, Manipal

VI SEMESTER B.TECH (MECHANICAL ENGG.) END SEMESTER EXAMINATIONS, APRIL/MAY 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. Derive an expression for shearing stress induced in a helical spring subjected to a compressive load. **(05)**

1B. A multileaf spring is fitted to the chassis of an automobile over a span of 1.2 m to absorb shock due to maximum load of 20 kN. All the leaves are to be stressed to 0.4 GPa when fully loaded. The spring has 2 full length leaves out of 8 leaves. The leaves are assembled with bolts over a span of 150 mm width at the middle. Determine the width and thickness of the leaves. The maximum deflection of the spring is 50 mm. What radius the leaves must be bent so that spring becomes flat under the given load? Take E=210 GPa. **(05)**

2A. A pair of continuously lubricated helical gears is used to transmit 24 kW at 2800 rpm of the pinion. The gear rotates at 1200 rpm. The teeth are having 20^0 full depth involute profile with helix angle of 45^0. Both the gears are made of heat treated forged steel. The gears are subjected to steady load with 10 hrs /day of service. The centre distance is about 175 mm with a permissible variation of 2 %.Take the face width as 15 times the normal module. Design the gears based on strength and check for wear load. **(07)**

2B. State any three assumptions for deriving Lewis equation. **(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 **(05)**

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.

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 full journal bearing 75 mm long supports a load of 7.3 kN. The L/d ratio is 1.5. The journal rotates at 750 rpm. The diametral clearance is 0.1 mm and the minimum film thickness is 0.02 mm. Determine (i) Viscosity (ii) Coefficient of friction (iii) Oil flow rate. **(05)**

4B. Define the following with respect to rolling element bearings **(03)**

(i) Dynamic load carrying capacity (ii) static load carrying capacity

(iii) Rating life

4C State the advantages and disadvantages of roller bearing over ball bearing. **(02)**

5A. A Steel wire rope is used with a hoisting drum of 1 m diameter to lift a load of 30 kN. The rope is of 20 mm diameter with 8 x 19 construction .The depth of the coal mine is 0.8 km and acceleration is 3 m/s^2. Determine the number of ropes required using a FOS of 5. The tensile strength of the wire is 1300 MPa. **(05)**

5B. Explain polygonal effect in a chain drive with a neat sketch. **(03)**

5C. State the advantages and disadvantages of V-belt drive over flat belt drive. **(02)**