Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (MECHANICAL ENGINEERING)
END SEMESTER EXAMINATIONS, DEC 2015/JAN 2016

SUBJECT: MECHANICAL DESIGN - II [MME 303]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Use of Design data hand book is permitted
- Missing data may be suitably assumed.

1A. With usual notations derive the equation to determine the axial deflection in helical compression springs. **05**

1B. A helical compression spring is 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 GPa. The spring index is 6. Determine **05**

i) the wire diameter
ii) number of turns
iii) free length of spring
iv) pitch

2A. A spur gear transmits 20 kW of power at 1200 rpm of pinion. The gear ratio is 3:1. The pinion is to have 18 number of teeth. The pressure angle is 20^0. The material of pinion is C30, (heat treated) and that of gear is C45, (untreated). The gears are subjected to medium shock with 8-10 hours/day of service. Design the gears based on strength. **05**

2B. With a neat sketch explain formative number of teeth applicable to helical gears. **05**

3A. A pair of right angle bevel gears transmits 10 kW at 1600 rpm of pinion. The pinion is of 100 mm, speed ratio is 4, material for pinion is untreated forged steel and gear is untreated C40. The gears are having 20^0 full depth involute form. Service factor is 1.5. Design the gears based on strength. **05**

3B. Define the following with reference to sliding contact bearing **05**

i) radial clearance ii) line of centers
iii) eccentricity ratio iv) bearing modulus
iv) minimum film thickness.

4A. A 50 BC02 single row deep row ball bearing which is to operate at 1500 rpm is acted upon by 8400 N radial load and 2700 N thrust load. The inner ring rotates. The load is steady and continuous. Determine the rating life of the bearing. **05**

4B. A V-belt drive transmits power of 2.5 kW from a motor running at 1200 rpm to a compressor running approximately at 400 rpm. The center distance is around 750 mm. The groove angle is 38°. The belts are subjected to light duty with 10 – 16 hours per day of service. Select the suitable belt drive and calculate the number of belts required. **05**

5A. With neat sketch the construction of wire ropes and explain the design guidelines followed for the selection of wire ropes. **05**

5B. Define the following with reference to worm gears **05**

i) lead angle ii) axial pitch iii) diametral quotient
iv) helix angle v) self-locking

6A. A chain drive is to transmit power from a 12 kW motor rotating at 950 rpm to a machine rotating at 320 rpm. The minimum center distance is 500 mm. The chain is subjected to light shocks with 8 to 10 hours of service per day. Find the number of strands required. **05**

6B. A simple band brake drum diameter of 600 mm has a band passing over it with an angle of contact of 210^0 as shown in fig. Q6B. The brake lever is 1 m long. The brake is to absorb 15 kW at 720 rpm. Take allowable stress as 80 MPa, coefficient of friction as 0.3 and the thickness of the belt as 3mm. Find: **05**

i) torque transmitted
ii) actuating force for clockwise and counter clockwise rotation of the drum
iii) width of the band

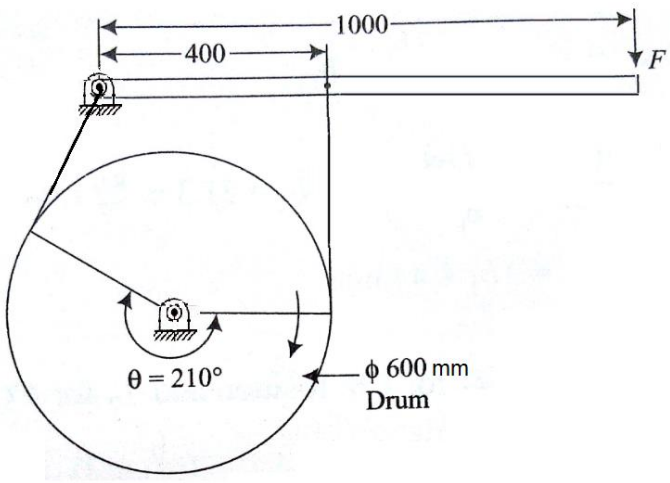

Fig. Q6B: All dimensions are in mm.