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**B.E/B.TECH (Full-time) Arrear End Semester Degree Examination, Nov/Dec 2012**

**Sixth semester**

**Mechanical Engineering**

**ME 9353 – DESIGN OF TRANSMISSION SYSTEMS**

**(Regulation 2008)**

18

**Time: 3 Hours**

**Answer All Questions**

**Max. Marks: 100**

**PART-A ( 10 x 2 = 20 Marks )**

1. Define the terms slip and creep with respect to the belts.
2. What does the term '6 x 7 rope' convey? State its application.
3. Why a  $20^\circ$  full depth involute system is better than the  $14\frac{1}{2}^\circ$  teeth system? Justify.
4. Explain the term helix angle.
5. Classify bevel gears.
6. Define axial pitch and lead angle with respect to worm gears.
7. What is ray/speed diagram?
8. Brief about the use of kinematic arrangement in the design of multi speed gear box.
9. List out the various follower motions in a cam mechanism.
10. What for clutches are used? Classify them?

**Part-B ( 5 x 16 = 80 Marks )**

11. Draw the speed diagram & the kinematic layout of the headstock gear box of turret lathe having an arrangement for 9 spindle speeds ranging from 31.5 r.p.m to 1050 r.p.m. Calculate the number of teeth on each gear. Take minimum number of teeth on a gear as 25.

12(a) A rope drive transmits 600 kW from a pulley of effective diameter 4 m, which runs at a speed of 90 r.p.m. The angle of lap is  $160^\circ$ , the angle of groove  $45^\circ$ , the coefficient of friction 0.28, the mass of rope 1.5 kg/m and the allowable tension in each rope 2400 N. Find the number of ropes required.

**[OR]**

12 (b) An open flat belt drive connects two parallel shafts 1.2 m apart. The driving and driven shafts rotate at 350 rpm and 140 rpm respectively and the driven pulley is 400 mm in diameter. The power to be transmitted is 1.1 kW. Design the drive.

13(a) Two spur gears are to be used for a rock crusher drive and are to be of minimum size. Gears are to be designed for the following requirements. Power is to be transmitted 18 kW, speed of pinion 1200 rpm, angular velocity ratio 3.5 : 1, tooth profile 20° stub. Assume the gears are made of case hardened alloy steel. Design the drive.

[OR]

13(b) A pair of helical gears subjected to moderate shock loading is to transmit 37.5 kW at 1750 rpm of the pinion. The speed reduction ratio is 4.25 and the helix angle is 15°. The service is continuous and the teeth are 20° FD in the normal plane. Design the gears, assuming a life of 10000 hours.

14(a) Design a bevel gear drive to transmit 3.5 kW. Speed ratio = 4. Driving shaft speed = 200 rpm. The drive is non-reversible. Pinion is made of steel and wheel of cast iron. Assume a life of 25000 hours.

[OR]

14(b) A speed reducer unit is to be designed for an input of 1.1 kW with a transmission ratio of 27. The speed of the hardened steel worm is 1440 rpm. The worm wheel is to be made of phosphor bronze. The tooth form is to be 20° involute.

15(a) A dry single plate clutch is to be designed for an automobile vehicle whose engine is rated to give 100 kW at 2400 r.p.m and maximum torque 500 Nm. The outer radius of the friction plate is 25% more than the inner radius. The intensity of pressure between the plate is not to exceed 0.07 N/mm<sup>2</sup>. The coefficient of friction may be assumed as 0.3. The helical springs required by this clutch to provide axial force necessary to engage the clutch are eight. If each spring has stiffness of 40 N/mm, determine the dimensions of the friction plate and the initial compression in the springs.

[OR]

15(b) The block brake as shown in Fig. 15b provides a braking torque of 360 Nm. The diameter of the brake drum is 300 mm. The coefficient of friction is 0.3. Find

- The force P to be applied at the end of the lever for the clockwise and counter clockwise rotation of the brake drum. (8)
- The location of the pivot or fulcrum to make the brake self locking for the clockwise rotation of the brake drum. (8)

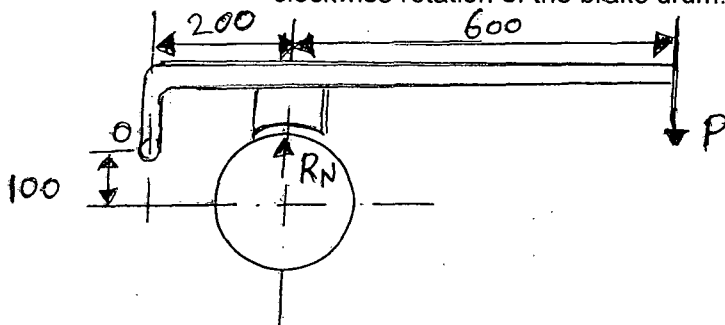


FIG. 15 b